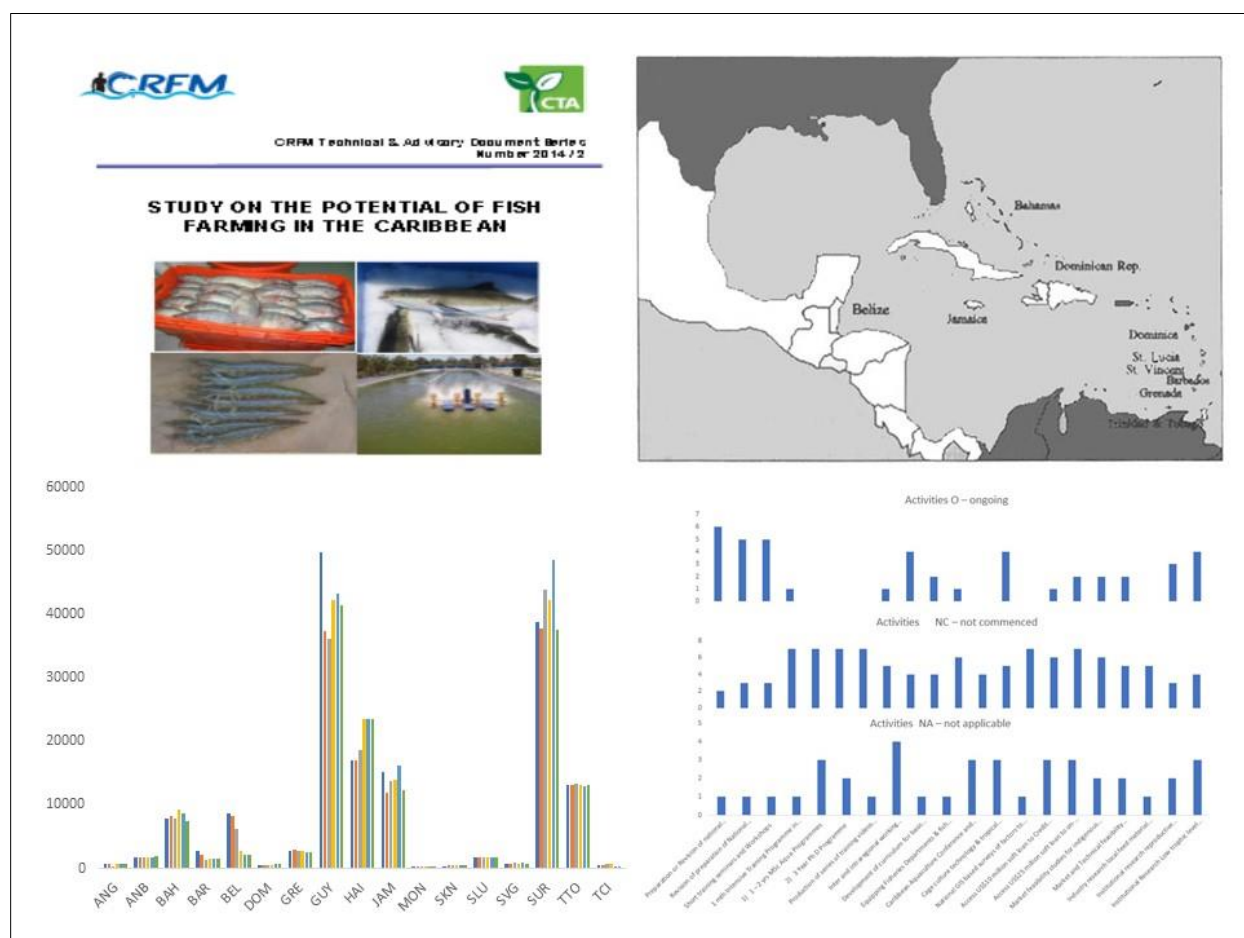


CRFM Technical & Advisory Document Series Number 2020 / 04

STATUS OF MEMBER STATES' IMPLEMENTATION OF THE 5-YEAR WORK PLAN FOR AQUACULTURE DEVELOPMENT IN CRFM



CRFM Secretariat
Belize
2020

CRFM Technical & Advisory Document Series Number 2020 / 04

Status of Member States' Implementation of the 5-Year Work Plan for Aquaculture Development in CRFM

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CRFM Secretariat
Belize

CRFM Technical & Advisory Document Series Number 2020 / 04
Status of Member States' Implementation of the 5-Year Work Plan for Aquaculture
Development in CRFM

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Acronyms and Abbreviations

BAIMS	Belize Agriculture Information Management System
CARICOM	Caribbean Community
CARIFORUM	Caribbean Forum of African Caribbean and Pacific countries
CC4FISH	Climate Change Adaptation in the Eastern Caribbean Fisheries Sector
CEFAS	Centre for Environment, Fisheries and Aquaculture Science (United Kingdom)
CFF	Caribbean Fisheries Forum
COVID-19	Coronavirus Disease 2019
CRFM	Caribbean Regional Fisheries Mechanism
CVQ	CARICOM Vocational Qualification
ECROP	Eastern Caribbean Regional Ocean Policy
EU	European Union
FAO	Food and Agriculture Organisation of the United Nations
FFO	Fisherfolk Organisations
GIFT	Gender in Fisheries Team
GIS	Geographic Information System
HEART-NTA	Human Employment and Resource Training Trust/National Training Agency (of Jamaica)
IMA	Institute of Marine Affairs (Trinidad and Tobago)
MSP	Marine Spatial Plan
NFA	National Fisheries Authority (Jamaica)
NGO	Non-Governmental Organisation
OECS	Organisation of Eastern Caribbean States
PY	Programme year
SAP	Strategic Action Plan
SFC	Sugarcane Feed Centre
SIDS	Small Island Developing State
SME	Small- and Medium-sized Enterprise
TCP	Technical Cooperation Project
UWI	The University of the West Indies
WGA	CRFM Working Group to Promote Sustainable Aquaculture Development

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Background

The objectives of the CRFM Working Group to Promote Sustainable Aquaculture Development (WGA) are to:

1. Promote sustainable aquaculture development at the national and regional levels, mainly for the purposes of:
 - increasing food production and security;
 - improving rural income and employment;
 - diversifying farm production; and
 - increasing foreign exchange earnings and savings.
2. Advise the Caribbean Fisheries Forum (CFF) on policies, programmes and projects to promote the development of aquaculture.

In keeping with these objectives, the WGA had, in 2015, proposed a 5-year work plan for aquaculture, which was endorsed by the CFF and approved by the CRFM Ministerial Council. In 2019, the working group reviewed implementation of the work plan and found that most of the activities under the plan had not been commenced. The WGA therefore proposed updates to the aquaculture plan of action and recommended that the plan be rescheduled to begin from Programme Year 2018 / 2019. In furtherance of this, the 17th Meeting of the Caribbean Fisheries Forum endorsed the updated 5-year Work Plan for Aquaculture Development in the Caribbean (5-year Action Plan), with the commencement period adjusted to the PY 2019 / 2020. This was subsequently approved by the Ministerial Council.

It is noteworthy that the estimated annual production by aquaculture from 2008 to 2018 was 9,290.8 metric tonnes (± 786.94 ; $\alpha = 0.05$)¹; with production for 2015² to 2018 falling within this range, suggesting that there has been little increase in aquaculture production in recent years. Given a stated desire to have aquaculture production contribute more to fish production (and thus to food security) in the region, implementation of the 5-year Action Plan may be considered an imperative for CRFM Member States.

Implementation survey

Between the end of February and the second week of July 2020, the CRFM Secretariat carried out a survey to determine the status of implementation and achievements to date with regard to the 5-year work plan on aquaculture. The survey (see *Appendix I*) was designed to capture all that countries are doing on aquaculture, both government-led and non-government-led activities. This included identifying not only activities led by the national fisheries authority, but all activities that are supported by donor, private sector and / or NGOs. By this means, the CRFM sought to determine if and which elements of the 5-year action plan for aquaculture development are being advanced satisfactorily, and areas of continuing weaknesses.

In keeping with the WGA's mandate to promote sustainable aquaculture development at the national and regional levels and to advise the Forum on policies, programmes and projects to promote the development of aquaculture, it was also envisaged that the survey results would inform planned WGA's activities to identify priority areas for a regional project proposal.

Individuals charged with responding to the survey were asked to indicate on a case by case basis whether an activity was: ongoing, not commenced, well advanced, almost completed, completed, completed but

¹ Figures were obtained from CRFM Statistics and Information Reports 2010 to 2018)

² in other words, from the initial institution of the action plan

requiring review / revision or further development, or not applicable. Respondents were also asked to describe what, if any, action was being taken which related to the activity.

Results

Overview

Eleven of the seventeen CRFM Member States responded to the survey³. Figures 1 to 6 present the results of the survey in terms of numbers of responding countries (y-axis) which had indicated the level of implementation⁴ of particular activities (x-axis; see column 2 of Table 1) cited in the 5-year Action Plan.

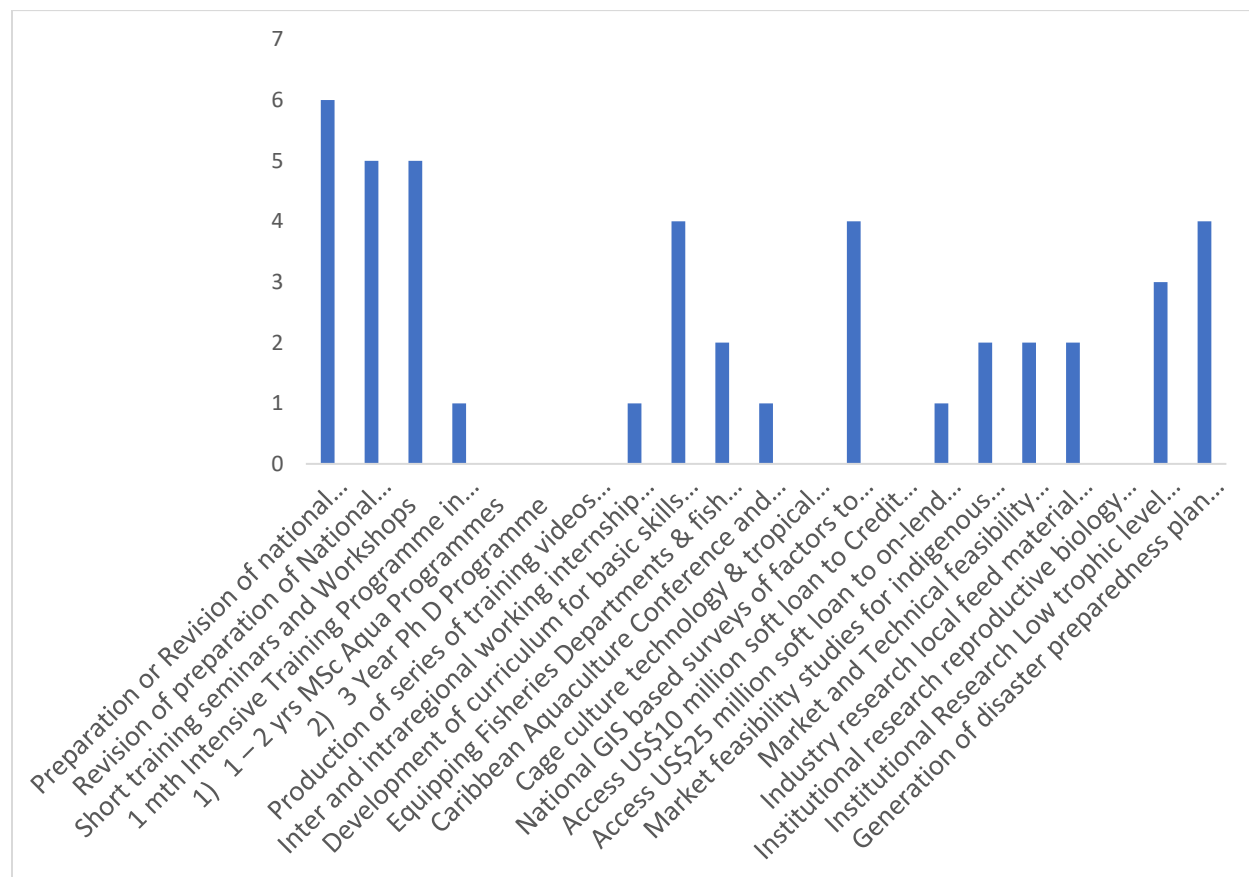


Figure 1: Number of countries where action plan activities are ongoing

³ Namely: Antigua and Barbuda, The Bahamas, Barbados, Belize, Dominica, Guyana, Jamaica, Saint Lucia, Suriname, Trinidad and Tobago and the Turks and Caicos Islands

⁴ ongoing, not commenced, well advanced, almost completed, completed, completed but requiring review/revision or further development, or not applicable. Where respondents left blank spaces, no effort was made to determine whether this was due to non-applicability or otherwise.

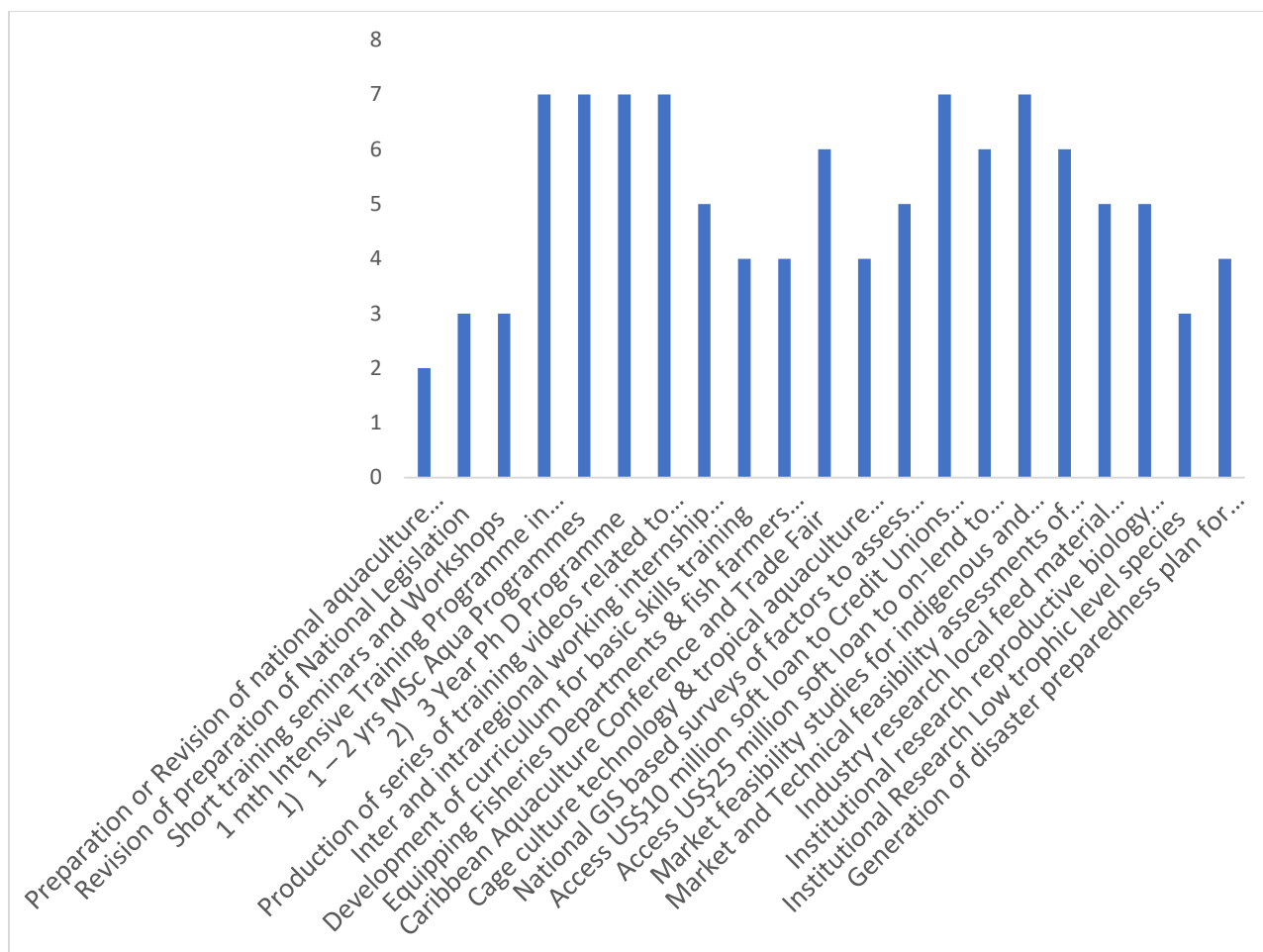


Figure 2: Number of countries where Action Plan activities have not yet commenced



Figure 3: Number of countries where Action Plan activities have been completed (but does not include those categorized as “almost completed”)

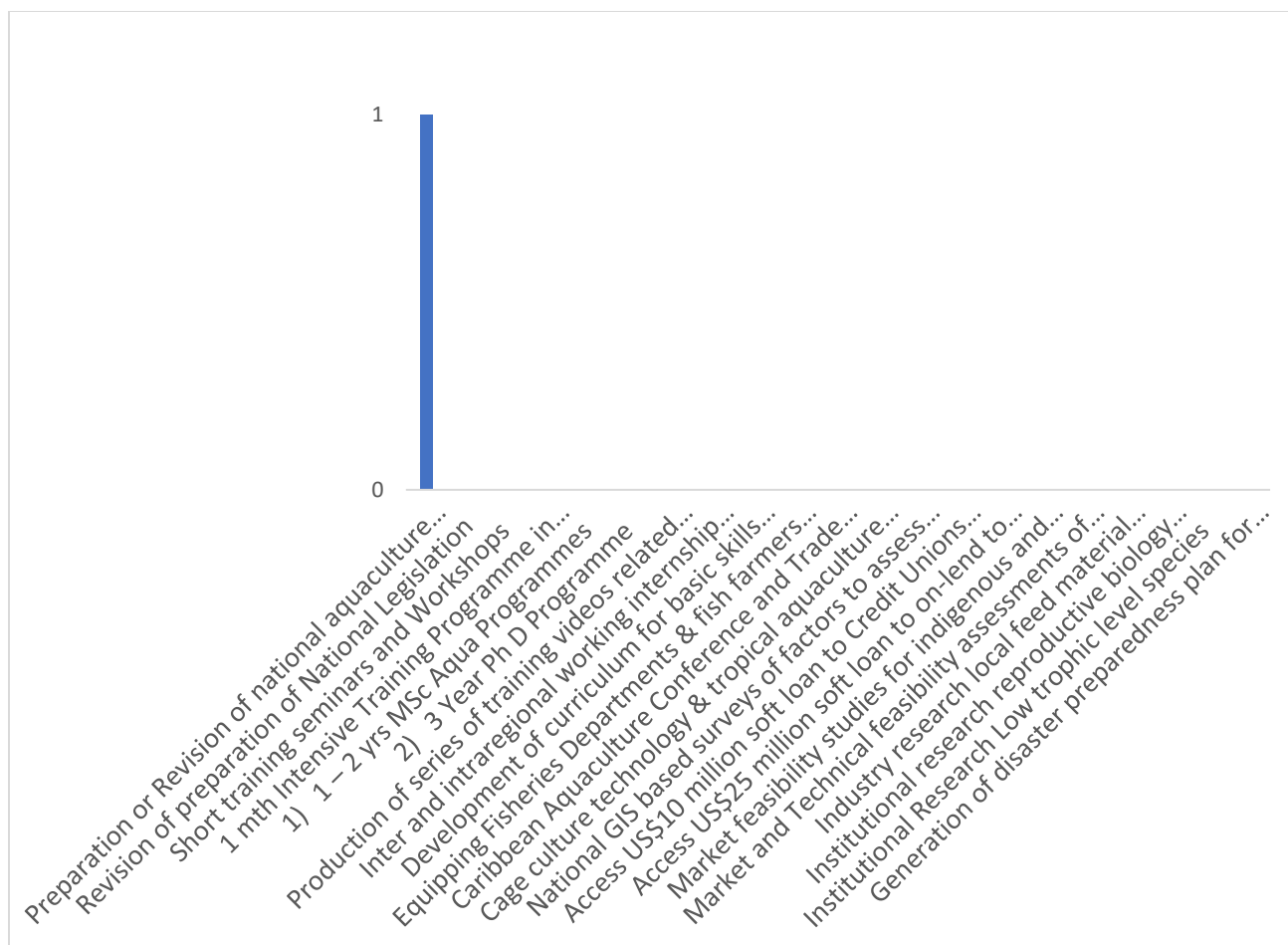


Figure 4: Number of countries where action plan activities are completed; but being reviewed and/or revised

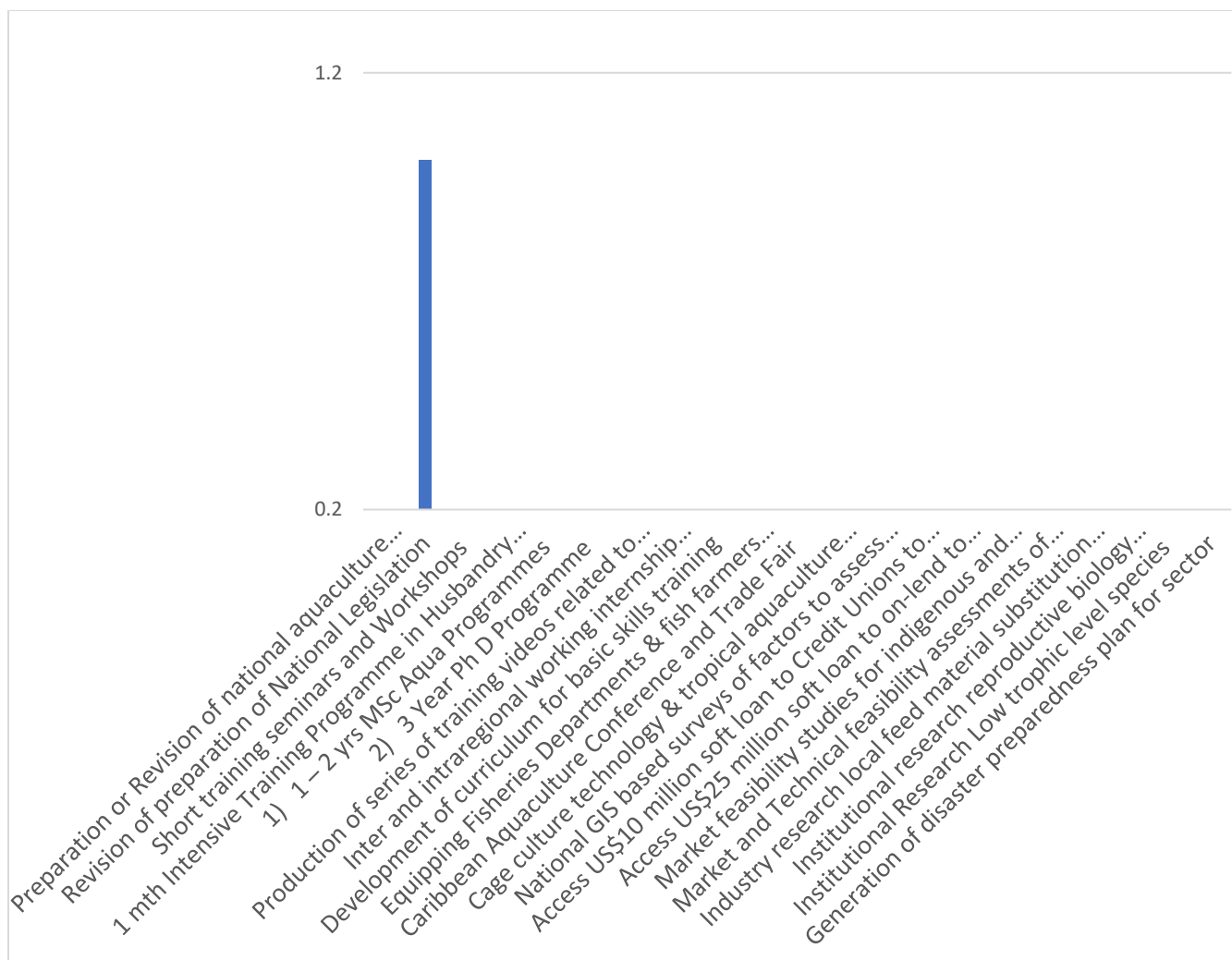


Figure 5: Number of countries where action plan activities are completed, but have aspects needing to be further developed

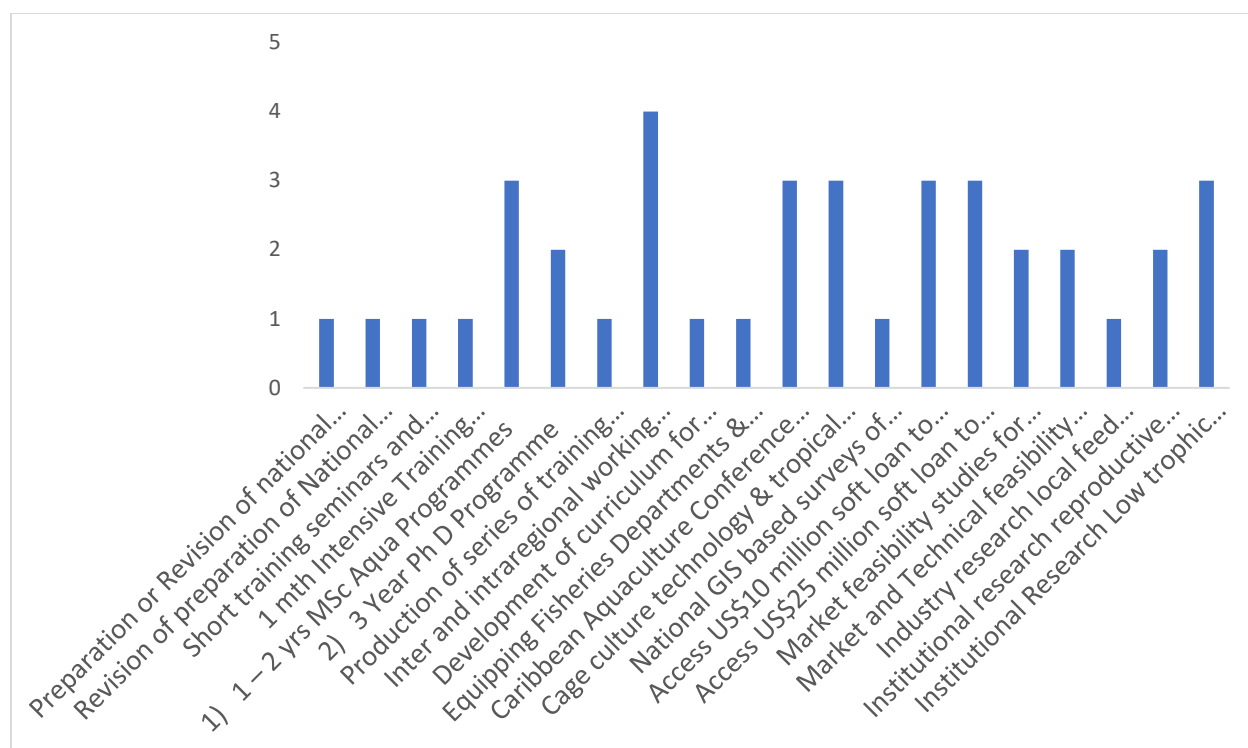


Figure 6: Number of countries where activities are cited as not applicable to the country in question

Figure 7 provides a juxtaposition of the responses with regard to activities that are ongoing, not commenced and / or not applicable, as these were the categories most frequently identified.

Table 1 presents the national actions that have been, or are being, taken with regard to the specific activities described in the 5-year Action Plan. In general, some kind of strengthening of governance frameworks or capacity building(-related) activity has been carried out / initiated. Relatively little has been done with regard to strengthening data management and knowledge sharing systems for aquaculture. While some work has been done with regard to market support, almost nothing has taken place to improve access to credit; neither has this been seen as being a priority worth addressing. Happily, some countries have addressed the issue of disaster risk management, but where this has been the case, it has not been specific to the aquaculture sub-sector, but to Agriculture as a whole.

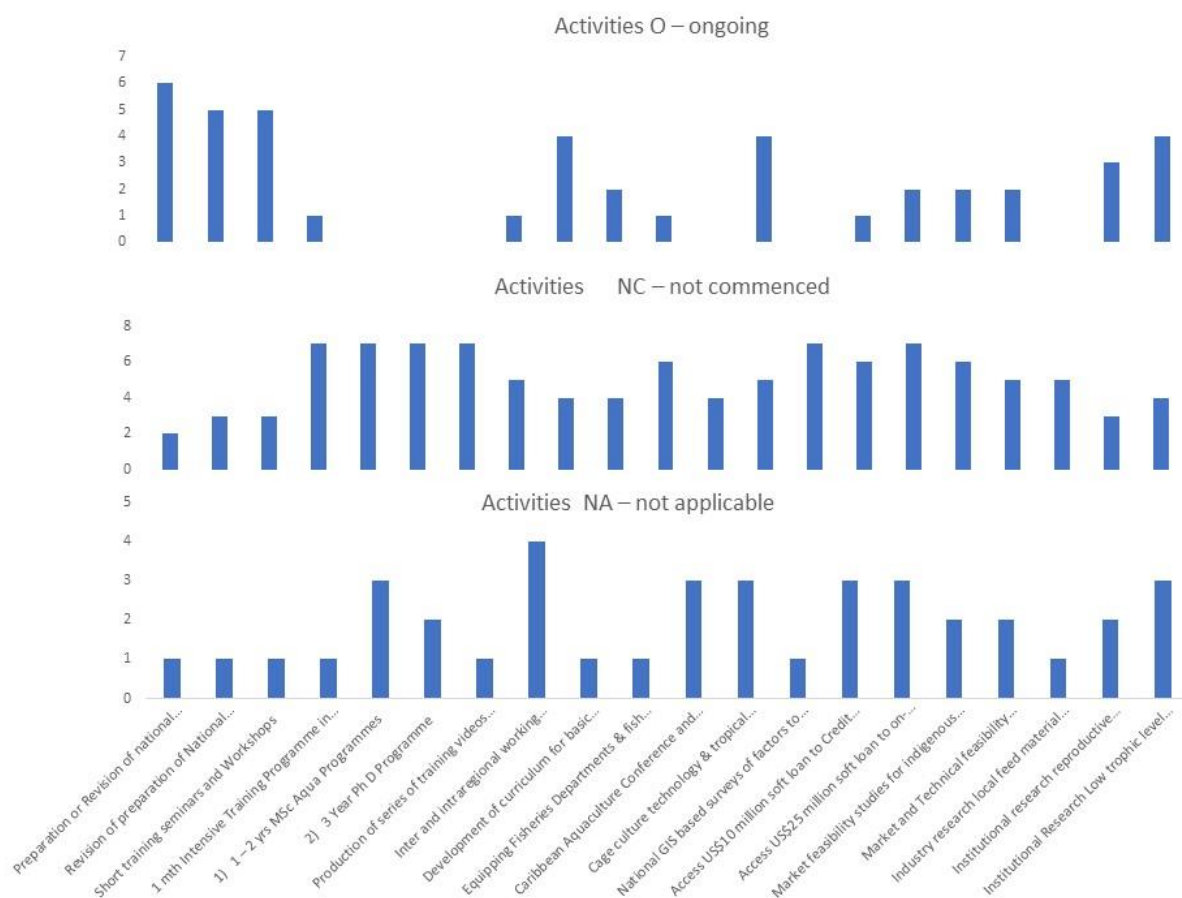


Figure 7: Comparative numbers of countries for activities that are ongoing, not commenced or not applicable

Table 1: National actions (being) taken in relation to activities stated in the Action Plan

Objective / Thematic Area	Activities	National actions (being) taken related to activity⁵
Strengthening governance frameworks	Preparation or Revision of national aquaculture plans and policies for up to 4 countries where required	<ul style="list-style-type: none"> • Belize reviewed the National Aquaculture Plan of New Zealand • Aquaculture Development Plan prepared, for Jamaica, with assistance from FAO circa 2011. • Development of 5-year Aquaculture Development and Management Plan (Draft) for Saint Lucia under FAO project TCP/SUR 3401 a national aquaculture development plan was drafted • Trinidad and Tobago has a draft plan with many revisions but no final plan or policy • Turks and Caicos Islands Initial Fisheries Management Plan expired in 2010; Sections including Aquaculture currently under revision
	Revision or preparation of National Legislation for up to 4 countries where needed	<ul style="list-style-type: none"> • Primary legislative framework for aquaculture already developed (Antigua and Barbuda Fisheries Act 2006) • A draft Belize National Inland Aquaculture Strategy 2020 - 2025 has been prepared. • Jamaica Fisheries Act 2018 has been enacted since 1 June 2019 • National Fisheries Policy (Draft); Revised Fisheries Legislation (Draft) prepared for Saint Lucia under FAO project TCP/SUR 3401 • Turks and Caicos Islands Fisheries Protection Ordinance is under review including sections of aquaculture
Capacity Building	Short training seminars and Workshops on (i) policy Development, (ii) risk analysis, (iii) quality assurance, value chain approach, (iv) fish farming as a business, (v) aquaculture extension, (vi) recirculation system / aquaponics short course in Univ of Virgin Isles	<ul style="list-style-type: none"> • Short training sessions were attended and completed by (Antigua and Barbuda) local farmers and fisheries extension officer covering areas such as: value chain, fish farming as business, fish seed production and quality assurance; One fisheries officer trained at University of the Virgin Islands in Aquaponics prior to 5 year plan • A Value Chain approach to Tilapia farming in Belize was executed in a 9-month effort. Improvements in quality assurance were done in the Aquaculture Unit. Workshop for primary school teachers operating Aquaponic systems was executed. • Jamaica National Fisheries Authority (NFA) Staff have been trained in aspects of aquaculture through the UNU-FTP Programme. • Three officers from Saint Lucia's Ministry of Agriculture and two farmers were trained in Aquaponics at Indies Greens in Antigua under CC4FISH Project. Establishment of aquaponics demonstration systems in 9 secondary Schools on island. JCCP Project Two officers trained in sustainable aquaculture under the Six months full study fellowship (United Nations University

⁵ Note: this column captures the text the country included in their response to the survey; without any further attempt at categorization/interpretation, other than capturing what the country had submitted

Objective / Thematic Area	Activities	National actions (being) taken related to activity ⁵
		<p>Fisheries Training Program Iceland). One officer trained under United States Department of Agriculture Cochran Fellowship Program in post-Harvest Handling</p> <ul style="list-style-type: none"> • Training programme in Commercial Aquaculture and Aquaponics conducted by the Trinidad and Tobago Fisheries Division on average every other month. Programme consists of four half-day sessions. (Good response, full enrolment of 75 persons per Cycle) (v) Aquaculture extension activities conducted by the Fisheries Division in an ongoing manner
	1-month Intensive Training Programme in Husbandry Practices of tropical aquaculture species.	<ul style="list-style-type: none"> • Belize indicated that no regional workshops were organized in 2019 and 2020. • One-week (Saint Lucia) farmer exchange in seamoss and aquaculture to the Philippines
	<p>1) 1- to 2-year MSc Aqua Programmes (6 candidates from the Caribbean).</p> <p>2) 3-year PhD Programme in aquaculture (1 - 2 candidates from the region)</p>	<ul style="list-style-type: none"> • No willing Belize candidates • 1 Jamaica NFA staff member has benefited from a scholarship at the MSc. Level to study mariculture and has completed the programme of study • One Saint Lucia staff has completed personal online training in a Masters level Aquaculture Degree
	Production of series of key (training and lessons learning) videos related to Caribbean specific aquaculture placed on online platform.	<ul style="list-style-type: none"> • No videos made thus far for Belize
	Inter and intraregional working internship programme for both private and public sector participants	Logistically and financially difficult for Belize

Objective / Thematic Area	Activities	National actions (being) taken related to activity ⁵
	Development of curriculum for basic skills training in aquaculture targeting youth and piloting in 4 countries	<ul style="list-style-type: none"> • Development for basic training in Aquaponics (Barbados): 1 course completed. 6 persons trained (mainly youth) target 40. “Towards a Caribbean Blue Revolution” project. • In Belize, work has been done at 2 high schools and one trade school at the national level. • The Aquaculture Branch of the Jamaica NFA produces in-house training for farmers and prospective farmers in the areas of tilapia and ornamental fish production. HEART-NTA in collaboration with the Aquaculture Branch and other sector partners has developed curricula to address tilapia and ornamental fish production • Saint Lucia has facilitated Development of Competency standards for Caribbean vocational qualifications CVQ) Inland Aquaculture Operation, Tilapia production Level (1) (CCFPAGIA1006) Aquaculture Grow out Operations Level (2). Aquaculture Grow out operations Level (3) (CCFPAG3003) Sustainable Sea Moss production Level (3). Development of Aquaculture Extension Manual. • Suriname not beneficiary • The National Training Agency (NTA) of the Ministry of Education of Trinidad and Tobago collaborated with stakeholders, including the Fisheries Division to develop the curricula. Curricula were developed for National Vocational Qualification (NVQ) programme for qualification of Technicians to work in aquaculture operations and CARICOM Vocational Qualification (CVQ). Curricula could be sourced from the NTA
Strengthening Data Management and knowledge Sharing Systems for Aquaculture (build on existing regional	Equipping Fisheries Departments & fish farmers associations and selected SME with Computer Facilities for collection, processing, storage and retrieval of data	<ul style="list-style-type: none"> • The Belize Ministry of Agriculture implemented the Belize Agriculture Information Management System (BAIMS). It is an online database for the storage of farmer information. Belize Fish and shrimp farmers have been included in the database • The Jamaica NFA is in the process of developing a Fisheries Information Management System which will include an aquaculture platform

Objective / Thematic Area	Activities	National actions (being) taken related to activity ⁵
knowledge platform)	Caribbean Aquaculture Conference and Trade Fair to promote knowledge exchange and opportunities in the region and Europe - Involving Caribbean and key European input e.g. (i) feed manufacturers and suppliers, (ii) General equipment - pumps, <i>hapas</i> hatchery etc. (iii) Cage culture technology, and (iv) tropical aquaculture research including health management	<ul style="list-style-type: none"> • None • The Jamaica NFA is in the process of developing a Fisheries Information Management System which will include an aquaculture platform
Aquaculture Suitability Surveys. (1) Site suitability surveys including GIS; and Production of portfolio of 5 economic viability studies for different prod systems	National GIS based surveys of biophysical, infrastructural and institutional factors to assess aquaculture potentials of country or region within country	<ul style="list-style-type: none"> • Completion of a (historic) National Assessment of the Barbados aquaculture sub-sector under the “Towards a Caribbean Blue Revolution” project. But further developmental work necessary. • BAIMS also included this information. • Under the EU-funded ACPFish2 Project, Jamaica prepared an Aquaculture Land and Water Use and Availability profile which identified areas that are suitable for aquaculture in Jamaica. • Preliminary mapping of inland and marine aquaculture sites around Saint Lucia • Basic GIS information is available in Trinidad and Tobago, but it is not comprehensive enough for decision-making regarding potential aquaculture establishment. Most interest is in Tank-based Culture and most aquaculture sites are based on private land. • There is a Darwin based Marine Spatial Planning Project that is currently gathering data for creation of an MSP for Turks and Caicos Islands.
Access credit regimes	Access US\$10 million soft loan to Credit	<ul style="list-style-type: none"> • No such proposal has been made for any sector in Agriculture / Aquaculture so far in Belize.

Objective / Thematic Area	Activities	National actions (being) taken related to activity⁵
	Unions to on-lend to fish farmers. This is best done as a revolving credit fund to targeting small to medium scale fish farmers with low interest rates	
	Access US\$25 million soft loan to on-lend to farmers to start-up fish farms	<ul style="list-style-type: none"> • Proposal for Belize National Agriculture Project to World Bank is being prepared now in 2020. Opportunity to get shrimp and tilapia aquaculture included in the project package. Funds are not to go to farmers or start up's but instead funds are for agriculture focused projects managed by the Government of Belize. • Suriname not beneficiary
Market Support	Market feasibility studies for indigenous and locally produced species	<ul style="list-style-type: none"> • Some work done under CC4FISH project - Feasibility Study on Climate Smart aquaculture for Antigua and Barbuda • No attempts to work with Belize local and indigenous species have been made. Limited resources are focused on commercial species in aquaculture. • Market feasibility studies were conducted by the University of the West Indies (UWI) and Sugarcane Feed Centre (SFC) of the Ministry of Agriculture, Land and Fisheries (MALF) of Trinidad and Tobago in previous years to guide investment. The studies would be available from the respective institutions.
	Market and Technical feasibility assessments Sf Ornamental Fish Culture	<ul style="list-style-type: none"> • Some work done under CC4FISH project - Feasibility Study on Climate Smart Aquaculture for Antigua and Barbuda • Ornamental fish culture is not practiced in Belize. A fishery of ornamental fishes is practiced and is thus not considered an aquaculture commodity • Not a policy priority for Saint Lucia at this time • Suriname not beneficiary
R&D	Industry research local feed material substitution small scale fish farming	<ul style="list-style-type: none"> • Small trials have been made, in Belize, to use mulberry as a supplemental feed. An alternative pelleted fish feed has also been done in 2020. • Development of four formulated and tested fish feed for tilapia and tambaqui⁶ at fingerling and adult stage using locally available ingredients in Guyana.

⁶ tambaqui is a large species of freshwater fish in the family Serrasalminae. It is native to tropical South America, but kept in aquaculture and introduced elsewhere. It is also known by the names black pacu, black-finned pacu, giant pacu, cachama, gamitana, and sometimes as pacu.

Objective / Thematic Area	Activities	National actions (being) taken related to activity ⁵
		<ul style="list-style-type: none"> Some trials have been conducted in Saint Lucia. capacity build of aquaculture farmers in feed formulation using local available materials through workshops
	Institutional research reproductive biology indigenous and local species	<ul style="list-style-type: none"> No attempt made by Belize Government or a tertiary level institution on aquatic species reproduction. Naturally bred Patwa <i>Cichlasoma bimaculatum</i> and <i>Arapaima giga</i> in Guyana. Hatchery production of <i>Macrobrachium carcinus</i> and grow-out trials conducted in Saint Lucia Suriname not beneficiary Research conducted by UWI, SFC and the Institute of Marine Affairs (IMA) - information is available from the respective institutions in Trinidad and Tobago
	Institutional Research Low trophic level species (sea urchin, sea cucumber, blue land crab)	<ul style="list-style-type: none"> Extremely limited work done under Antigua and Barbuda's regular fisheries biological programme trying to collect basic information on species. University of Belize has made some trails with sea cucumber grow-out in earthen ponds. Results were not encouraging. There is an ongoing project with CEFAS to pilot lobster cage culture with sea moss production in Saint Lucia. It is hoped that the resulting improvement in water quality in the bay will also benefit blue land crab plus sea urchins Suriname not beneficiary
Adaptation to Climate Change	Generation of disaster preparedness plan for sector	<ul style="list-style-type: none"> Antigua and Barbuda reviewing the CRFM Model Fisheries Disaster and Risk Management Plan particular the section related to the Model Disaster and Risk Management Plan A national agriculture plan for Belize related to COVID 19 was prepared out of the immediate need in early 2020. No plan has been made for storms and hurricanes and other climate change scenarios A National Integrated Disaster Risk Management Plan and Implementation Strategy and an Agriculture Disaster Risk Management plan (2013 - 2018) exists, for Guyana, that addresses fisheries and aquaculture. MICAF has developed a Disaster Risk Management Strategy for Jamaica, the Aquaculture Component needs to be strengthened. Development of Saint Lucia National Action Plan for climate change adaptation and Fisheries Sectorial Adaptation Strategy Action Plan Suriname not beneficiary

Objective / Thematic Area	Activities	National actions (being) taken related to activity ⁵
		<ul style="list-style-type: none"> • The Ministry of Agriculture Lands and Fisheries (MALF) has developed a Disaster Risk Management Plan for the Agriculture Sector of Trinidad and Tobago under which Action Plans for different hazards would be developed – Aquaculture would be considered under plans for drought and flooding and any other relevant hazards.

Figures 8 to 28 show numbers of States with each level of activity status⁴, by thematic area.

Strengthening governance frameworks

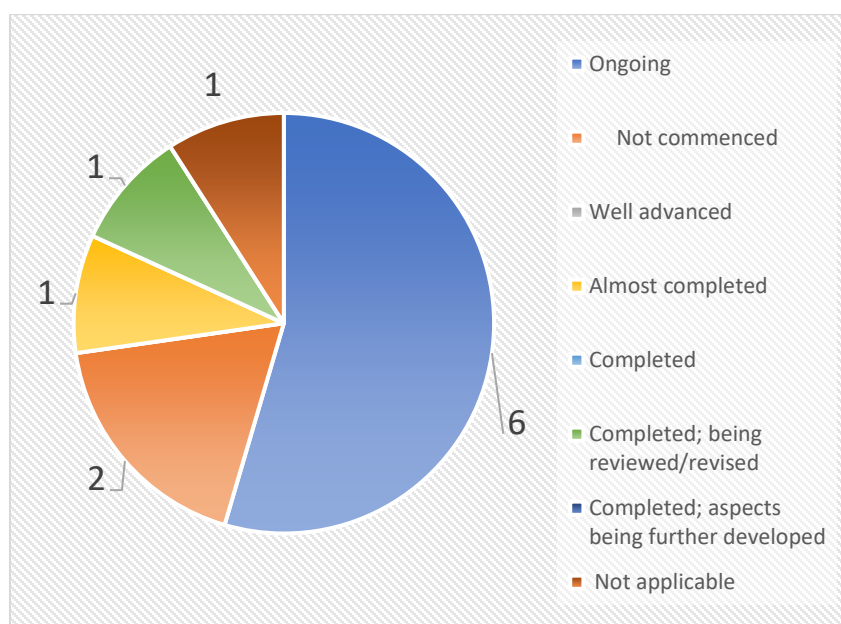


Figure 8: Preparation or revision of plans or policies

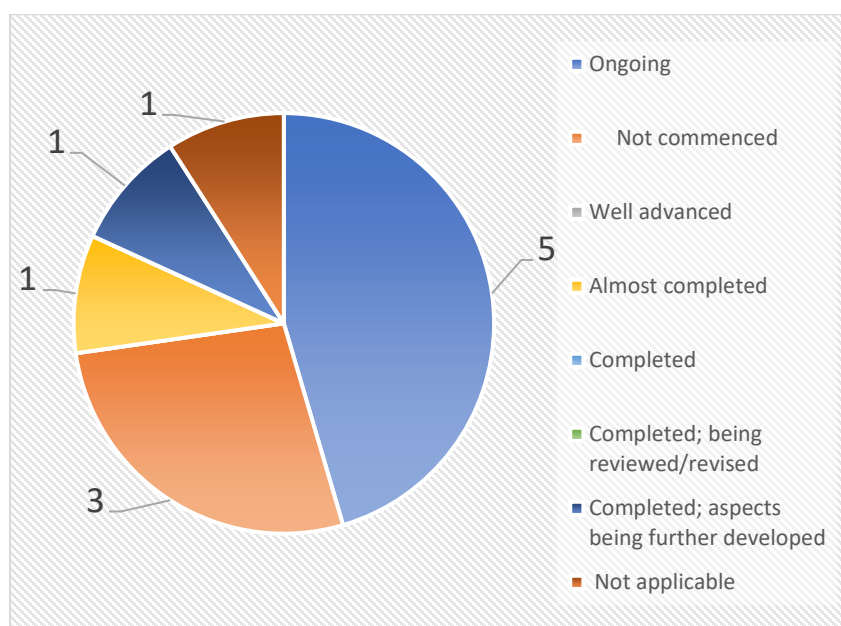


Figure 9: Revision of preparation of national legislation

Capacity building

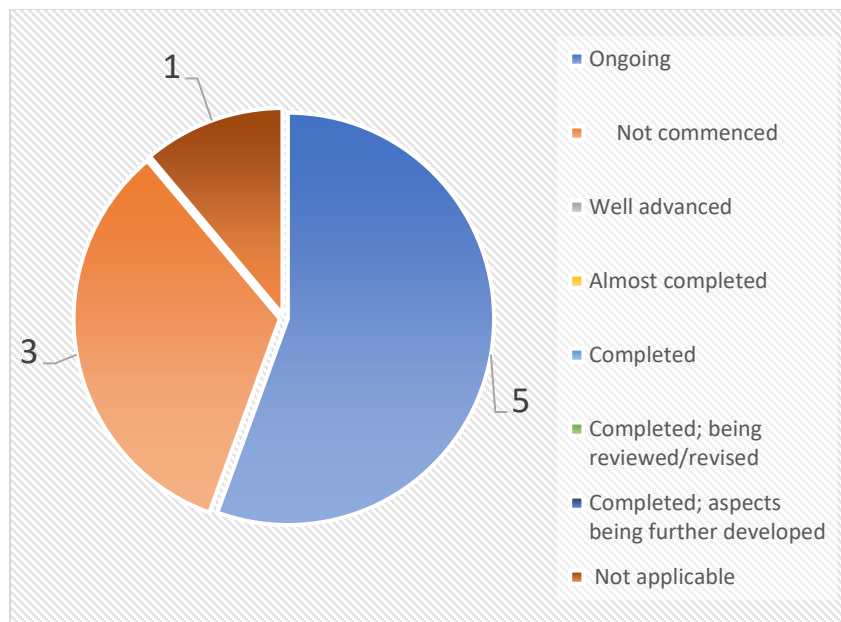


Figure 10: Short training sessions and workshops

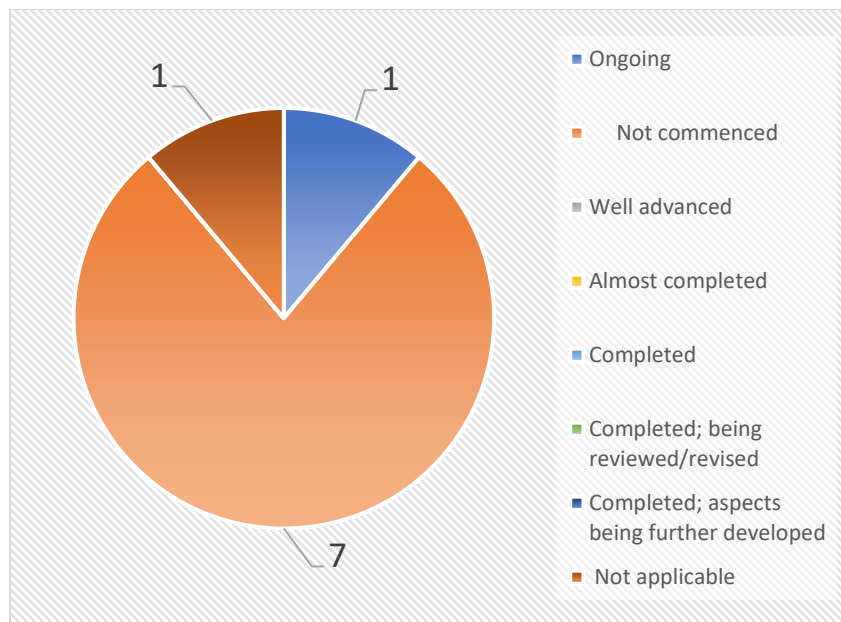


Figure 11: One-month intensive training programme in husbandry of tropical aquaculture species

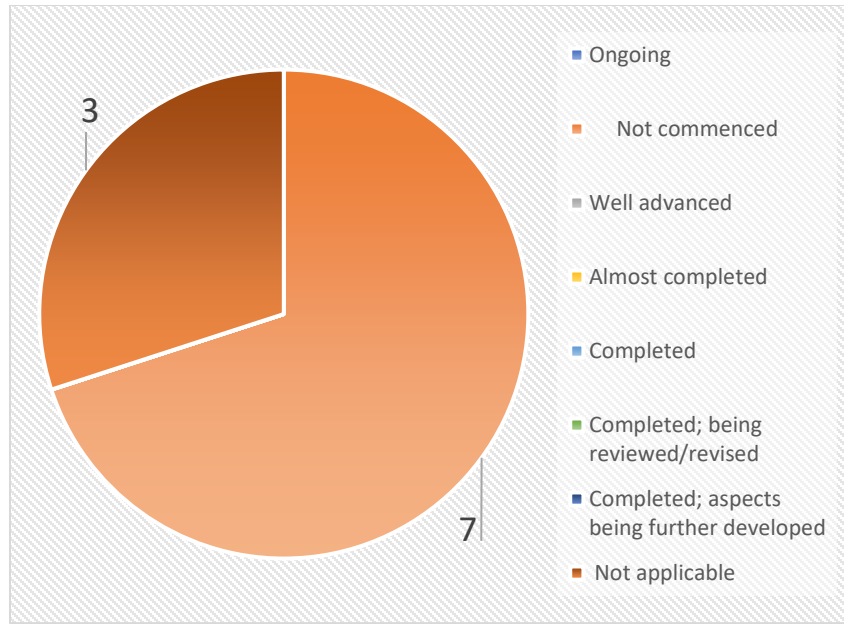


Figure 12: One- to two-year MSc aquaculture programmes

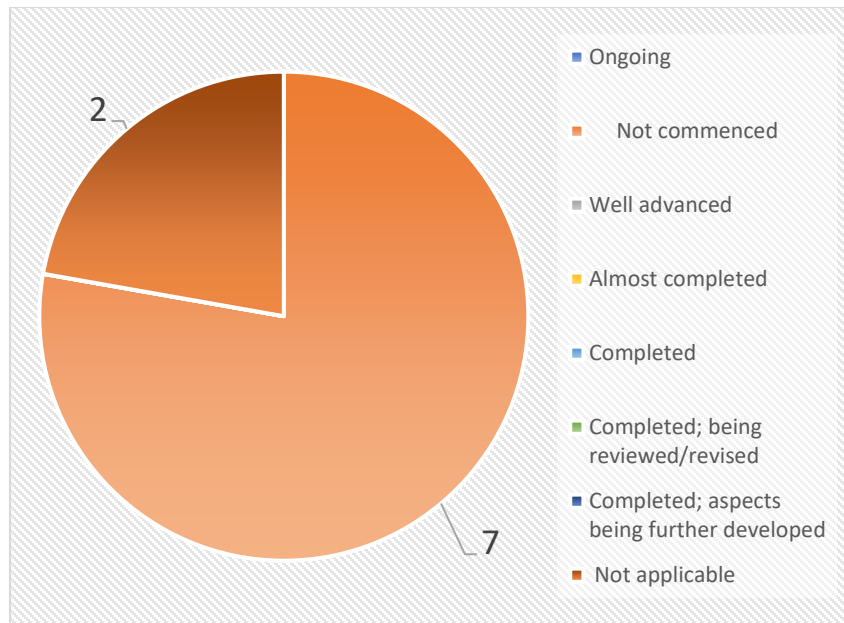


Figure 13: Three-year PhD programmes

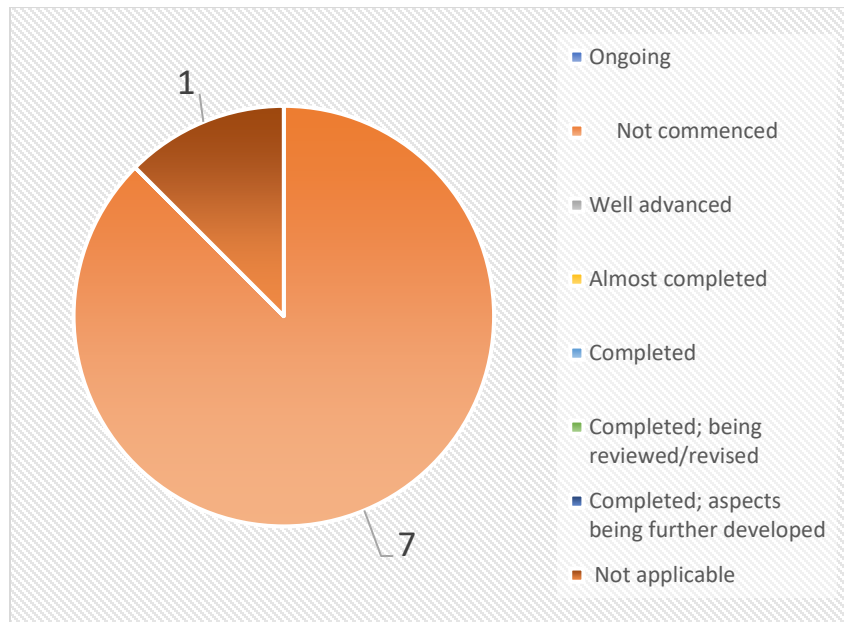


Figure 14: Production of series of videos related to Caribbean aquaculture

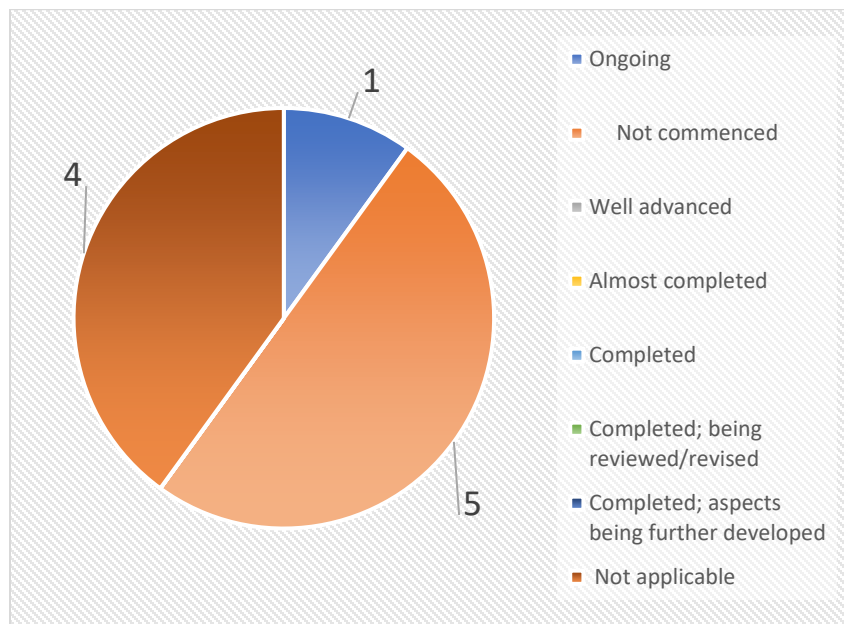


Figure 15: Inter- and intra-regional internship programmes

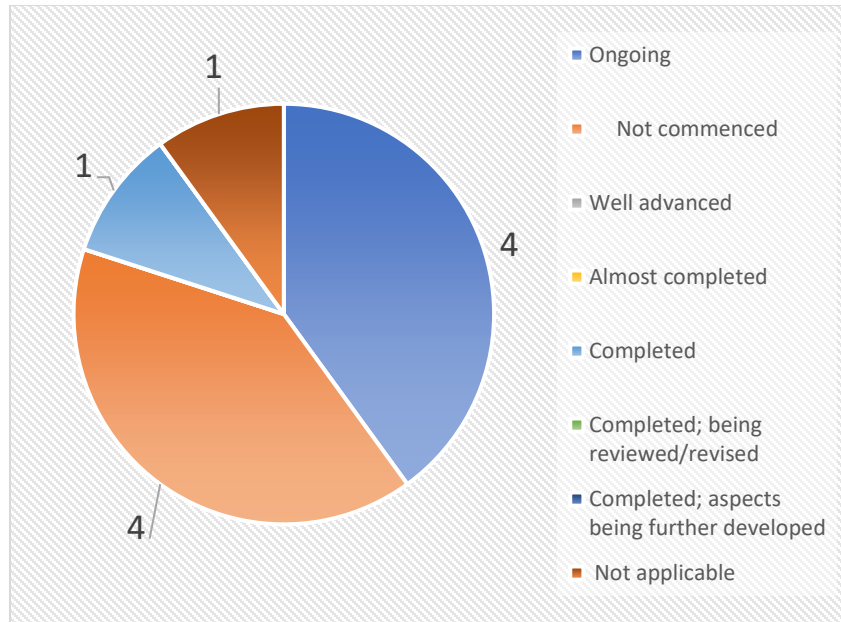


Figure 16: Development of curricula for basic skills training

Strengthening data management and knowledge sharing

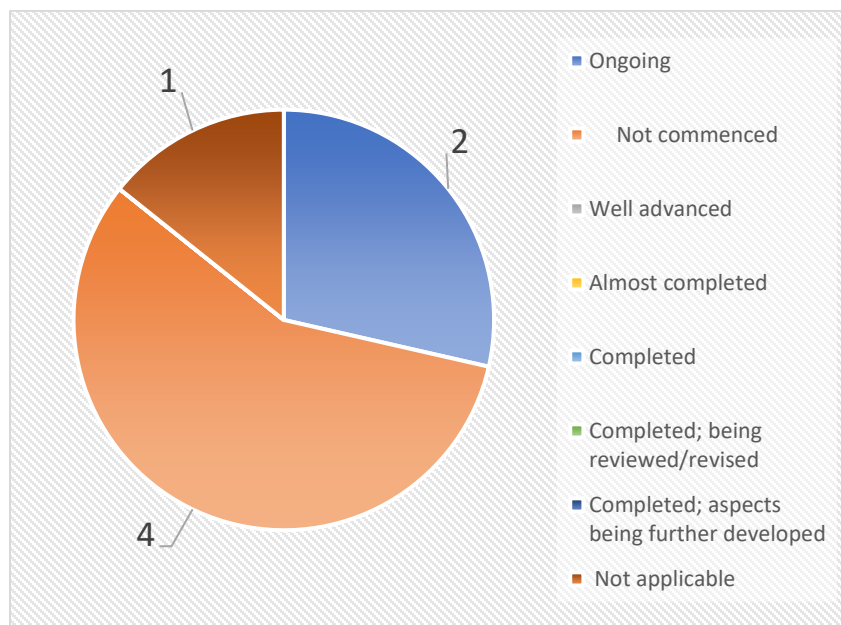


Figure 17: Equipping fisheries departments, fish farmers' associations and SMEs with computer facilities

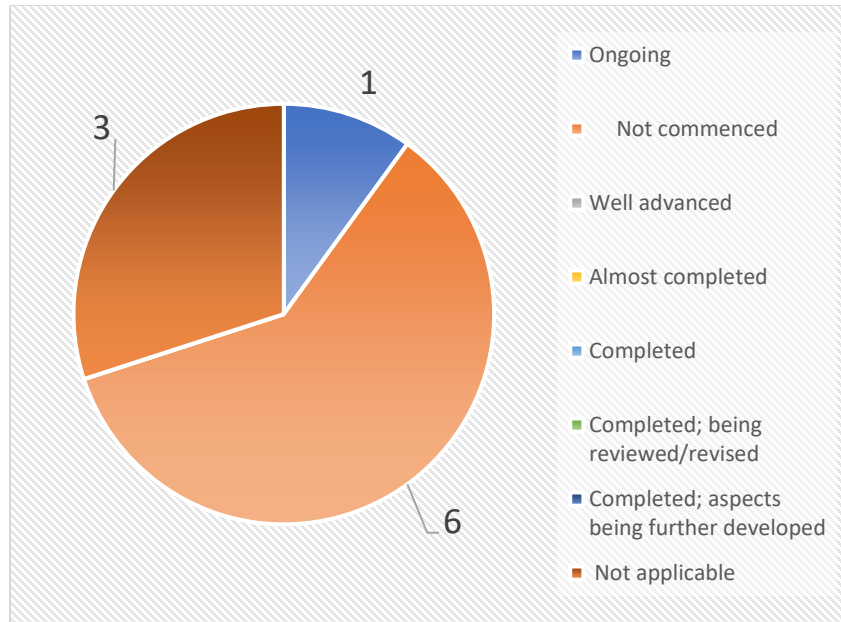


Figure 18: Caribbean aquaculture conference and / or trade fair

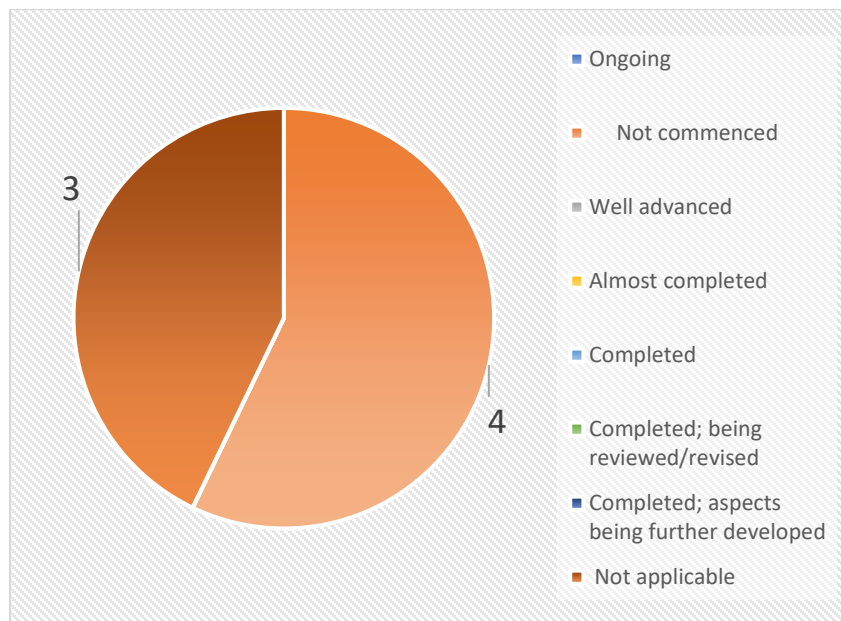


Figure 19: Cage culture technology and tropical aquaculture research

Aquaculture suitability surveys

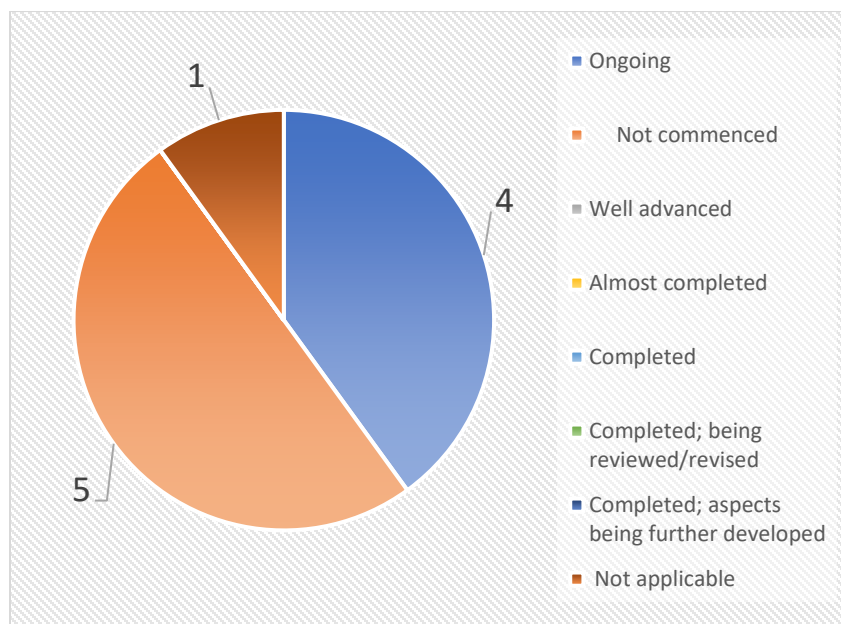


Figure 20: National GIS-based surveys of factors to assess aquaculture potential

Access credit regimes

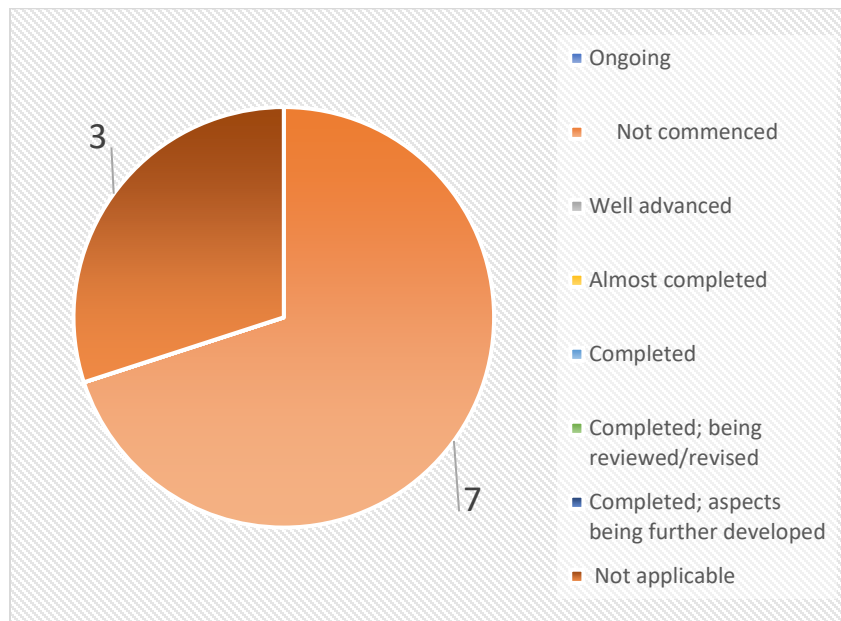


Figure 21: Access \$10 million soft loan to credit unions to on-lend to farmers

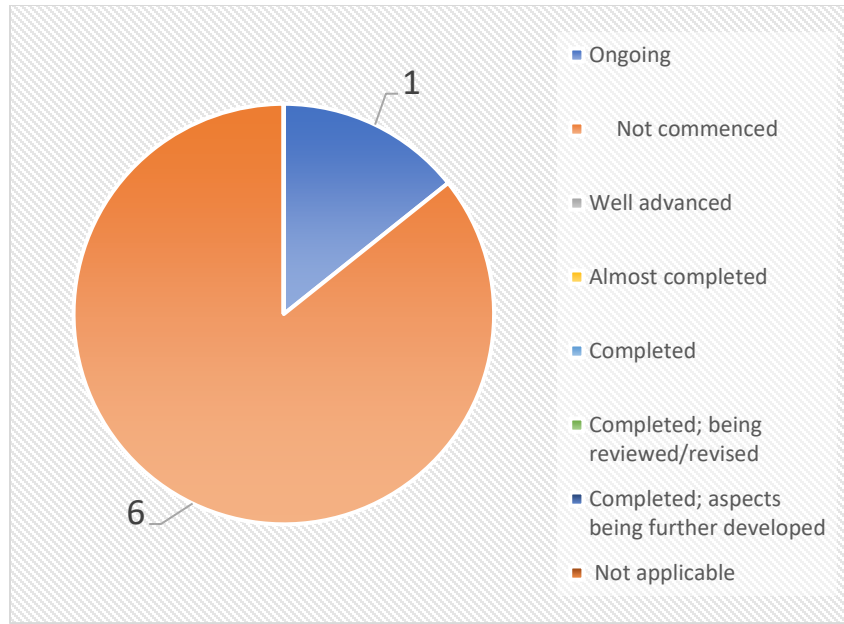


Figure 22: Access \$25 million soft loan to on-lend to farmers to start-up fish farms

Market support

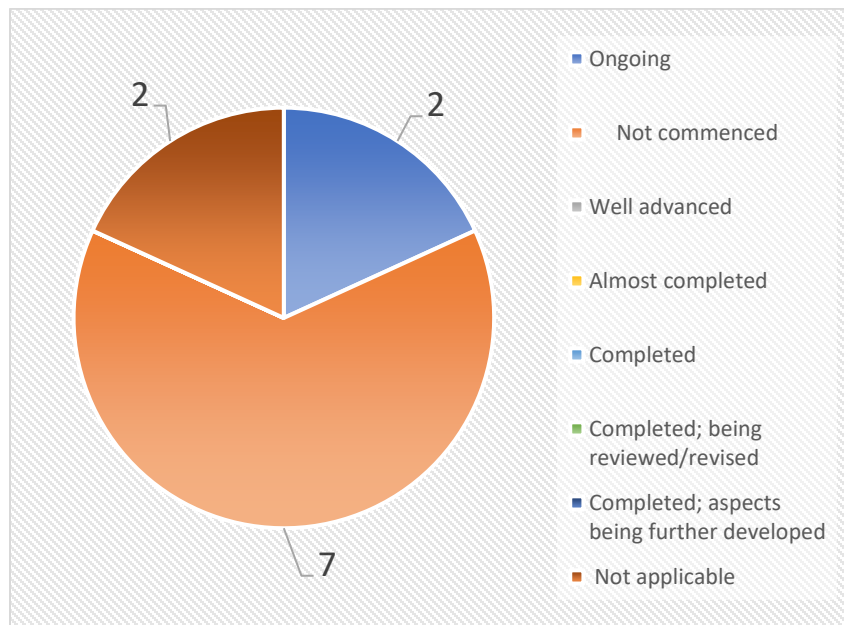


Figure 23: Market feasibility studies for indigenous and locally produced species

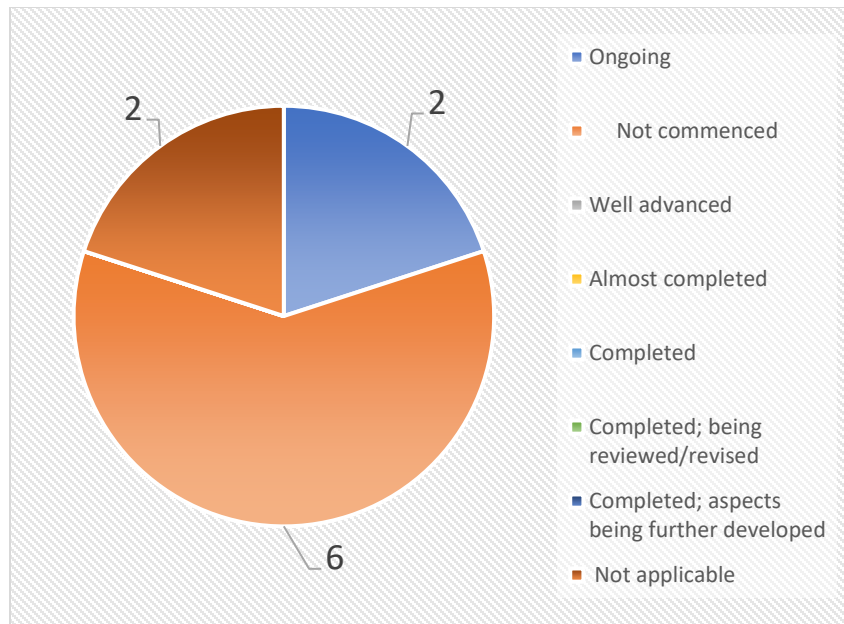


Figure 24: Market and technology feasibility assessments of ornamental fish culture

Research and Development

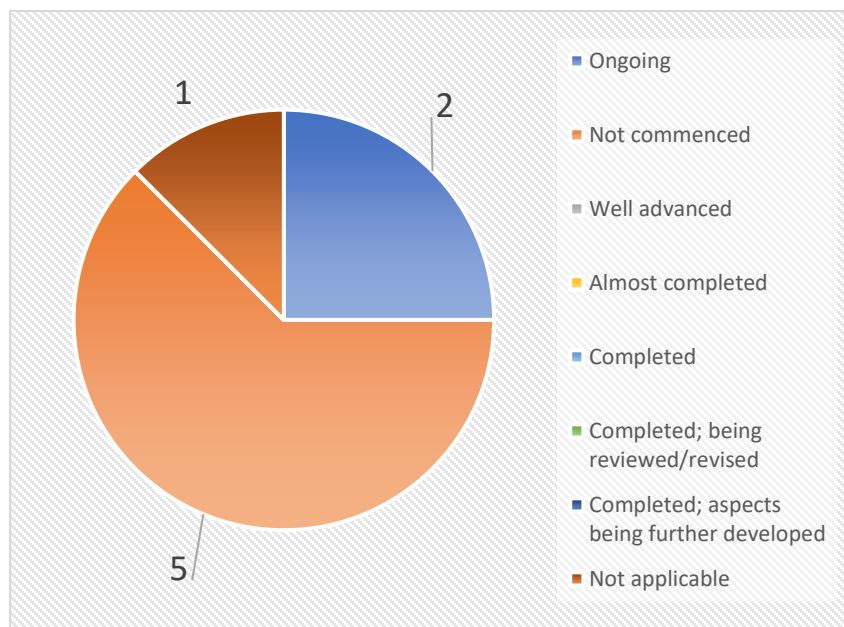


Figure 25: Industry research on local feed material substitution in/for small-scale fish farming

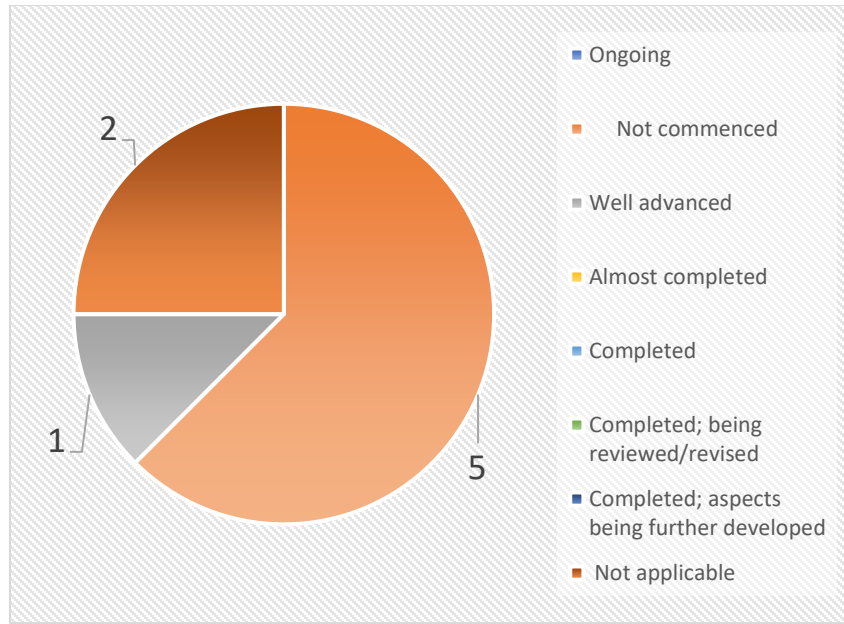


Figure 26: Institutional research on reproductive biology of indigenous and local species

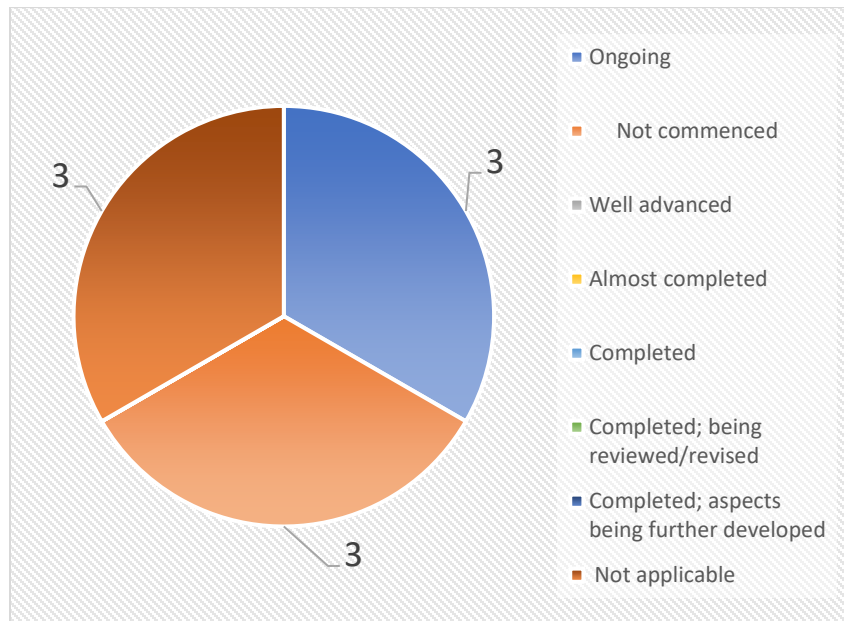


Figure 27: Institutional research of low trophic level species

Adaptation to climate change

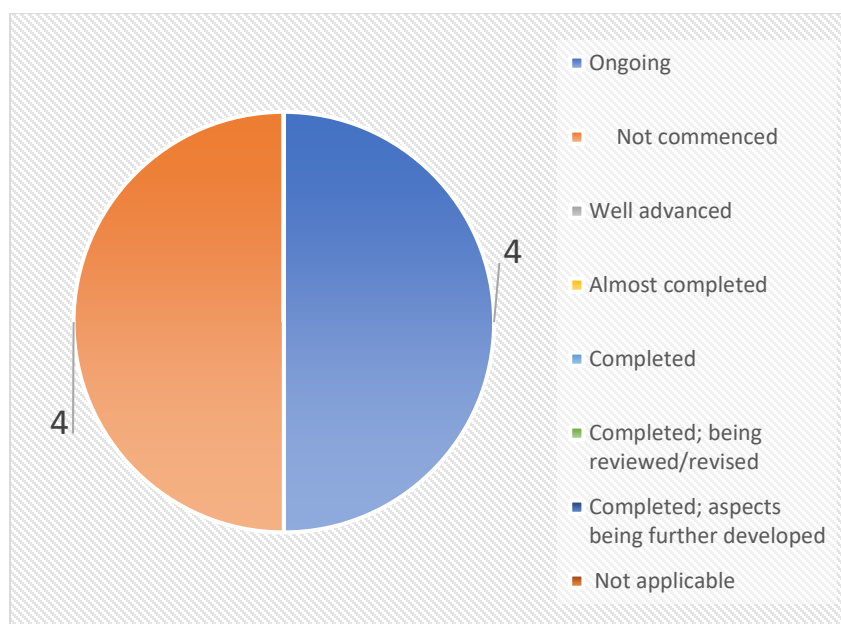


Figure 28: Generation of disaster preparedness plan for the sector

Discussion

General

In overview, while most aspects of implementation of the workplan have not yet been commenced or are considered not applicable, development and / or revision of plans and policies have received the most attention by responding countries, this has been followed by revision / development of relevant legislation. Figure 7's juxtaposition of the responses with regard to activities that are ongoing, not commenced and / or not applicable, arguably, can be seen as pointing to the clear gaps in implementation of the action plan activities: in the main, those activities that are not currently ongoing have not been commenced or are being thought not to apply to the particular countries.

No activities were considered to be well advanced or almost completed. Only one country felt that they had (definitively) completed an activity (the development of curricula for basic skills training); by comparison, one respondent opined that the preparation / revision of a national aquaculture plan / policy was completed, while indicating, nonetheless, that this instrument was in need of review / revision and one other respondent thought that while national legislation related to aquaculture had been revised / prepared, there was need for this to be developed further.

The number of activities that were considered "not applicable" to countries is interesting (some may say instructive), especially in an approved regional action plan. In considering this issue, the question needs to be asked as to whether this is because (a) the activity really does not apply to that country or (2) it is just not something they are looking at doing (at this time). Experience and observation suggest that a number of issues, which some respondents cite as not applicable, simply have not been given serious consideration as yet in the country, even though these actions are needed "across the board". Exemplifying this is the fact that most of the respondent Member States have either not commenced seeking to access credit for on-lending and/or have seen this as being inapplicable.

Possible factors affecting implementation

Several factors should be considered in status of implementing the 5-year action plan. Probably most notable among these is the inadequacy of the human capacity, including for business planning and implementation; whether by way of numbers of persons or areas of study, within national fisheries agencies to lead and support aquaculture development. Most of the national fisheries agencies in Member States have their genesis in marine capture fisheries and the management thereof, except for a few member states, therefore, the very ethos of the approaches to aquaculture management and development may not be appropriate for leading / guiding aquaculture development in keeping with what may actually be necessary. In a number of Member States, the most significant resources (other than human) needed for (terrestrial) aquaculture are land and water: the limitations in availability of (appropriate quantities / quality of) both these resources in a majority of SIDS (in particular those making up the eastern Caribbean chain of islands) precludes / limits development of aquaculture to the extent required to substitute / replace demand for marine capture species, whether for local consumption or export. Additionally, potential aquaculturalists are challenged in acquiring the initial capital investment needed for their venture(s). Another consideration is that the economic value of the marine capture species is usually higher than aquaculture species, which are normally of a lower value in the Caribbean context (e.g. tilapia, catfish, etc.). In cases where there are high valued species (e.g. shrimp), there is investment from large companies. This, conceivably, could make countries less interested in investing in aquaculture at the national level.

Thoughts on a way forward

Notwithstanding the increasing role that aquaculture has been having globally in terms of its contribution to fish production, the region should be cautious about being overly optimistic about the contribution of aquaculture; except for the countries with relative abundances of land and water. The decision by the OECS Countries in 1994 (4th OECS Meeting of Fisheries Management and Development) that aquaculture should not be promoted as a replacement for or to complement marine production, but left as an option for farmers' land use; with fisheries departments / divisions being supportive, may still be considered valid. In that context, it is instructive to note that the 1999 OECS Fisheries Management and Development Strategy only addresses aquaculture from the viewpoint of research in section 3.4.3 the identified actions are to: "Develop applied research programmes on aquaculture / mariculture" and "Carry out applied research on aquaculture / mariculture". In fact, this is the only place, either in "Aim 2: Market diversification within the fisheries sector" or "Aim 3: Diversified and sustainable production base", where any mention of aquaculture is made. Further, in the Eastern Caribbean Regional Ocean Policy (ECROP) and Strategic Action Plan (SAP), approved by the OECS Authority at its 57th Meeting in June of 2013, no mention of aquaculture is made as a policy direction or goal (except implicitly, where the ECROP SAP refers, in Action 3.1 Develop the ocean economy, to supporting "continued implementation of the OECS Fisheries Management and Development Strategy and Implementation Plan")

For the insular eastern Caribbean island chain, areas that allow for mariculture are on the east coasts which, while sloping seaward more gently, may arguably be considered too high energy for the most likely types of small to medium scale mariculture. On the west coasts, the drop-offs often occur sharply and are likely not to be amenable for anything small to medium-scale other than cage culture; but, the west coasts are the areas of high population, settlement and (often) agriculture with the limitations that these place on land-based aquaculture and the challenges (e.g. land-based sources of marine pollution; "praedial" larceny) they bring to mariculture. Additionally, the same west coasts (bays and ports, ideal for cage culture) are where most of the marine transportation is focused (tourist ships, container cargo vessels, oil tankers): also posing challenges of physical damage to mariculture structures. Having said that, where countries (example Belize, Guyana, Jamaica, Suriname) have the land space and available freshwater resources, or extensive marine coastline (such as The Bahamas), they should/could be encouraged / supported with their land-based aquaculture; and, possibly near-shore mariculture.

Mindful of the above factors, consideration may need to be given to view aquaculture (whether terrestrial or marine) more as a business enterprise, than has hitherto been the case with commercial marine capture fisheries; with the focus on business development in a manner similar to agriculture, whether in terms of management or investment; indeed, by way of providing market support. This ongoing weakness in the enabling environment may explain why almost nothing has taken place to improve access to credit; neither has this been seen as being a priority worth addressing. If aquaculture is to play its much-touted potential role in boosting fish production, food security and employment in the region, this must be remedied. Aquaculture research and development should also be seen within this context; with a strategic focus on supporting investments and partnership between the public and private sectors, in collaboration with financial / credit institutions.

Monitoring and evaluation

There is need to monitor implementation of the 5-year Action Plan. Given the biennial planning cycle for CRFM, it would be best to carry out a similar survey (utilising the same survey instrument), six months before the end of the biennium. This would allow two months for circulation and responses and one month for analysis, such that the results would be ready to “feed” into the preparation of the next Biennial work plan which would be approved in time for the beginning of the next biennium the following April.

Thus, the next survey to monitor implementation of the current action plan would commence circa October 2021, such that the results would be ready by December of that year, to be incorporated into the 2022 - 2024 Biennial work plan. Hence, there would be two and a half monitoring / planning cycles before the end-date for the current 5-year Action Plan and preparation of the updated plan. Updating of the action plan could thus begin mid-way in 2022, with a view to its completion and by March / April of 2023 allowing for subsequent commencement of implementation of the next 5-year action plan at the beginning of the 2023 - 2024 programme year

Appendix 1. Survey instrument

Five-year Work Plan for aquaculture development in the Caribbean Current status of Member State implementation

Country: _____ Name of respondent: _____

Although the potentials for aquaculture development in the CARICOM / CARIFORUM Region have not been systematically and comprehensively assessed, it has been surmised that the scope for development is tremendous. This is based in large measure on the primary resource assets of the region. The Study on the Potential of Fish Farming in the Caribbean⁷ posits that the sustainable development of aquaculture requires an approach which recognizes the three (3) pillars of sustainability⁸:

Effective responses to address the ecological challenges of sustainability at the broad sector and national levels include:

- Increasing investment in technological innovation and transfer in the areas of breeding and genetics, disease control and feed and nutrition
- Use of Spatial Planning and Zoning to guide aquaculture development at the landscape and seascape levels
- Shifting Development Incentives to reward improvements in productivity and environmental performance

Effective responses in relation to social aspects of sustainability include:

- Implementation of pilot-scale projects based on viable economic models
- Use alternate energy sources such as wind, hydro and solar
- Capacity building in the areas of governance and policy development, technical husbandry processes and procedures and extension methodologies

Responses in relation to the economic aspects of aquaculture include:

- Determination of total cost of development which needs to be incorporated into the transactional costs of the sector
- Acquisition of stock insurance against diseases and natural disasters
- Development of risk assessments and traceability protocols and regulations

The 5-year workplan for aquaculture development proposes greater involvement of the private sector, strengthened partnerships and cooperation between the CARIFORUM Member States and its international development partners, as well as improved inter-regional cooperation among ACP regions. The CARIFORUM Governments are to provide in-country logistical support and personnel presence while the international partners are to provide technical and capital assistance.

⁷ CRFM, 2014. Study on the Potential of Fish Farming in the Caribbean. CRFM Technical & Advisory Document No 2014 / 2. p78

⁸ recognising associated constraints and challenges; as well as elucidating the responses that would be necessary to resolve these challenges

The approved programme areas identified for external participation and support, have been premised on the assumption that the various nation states are at varying levels of development and the selection of any given state to participate is based on identified needs.

The CRFM Secretariat seeks to determine Member States' progress in implementing the 5-year work plan at the national level, with a view to determining priorities for a regional project proposal concept. To this end, the Secretariat would be grateful if you would populate the table below, from the perspective of your country's progress.

KEY: O – ongoing NC – not commenced WA - well advanced AC – almost completed NA – not applicable

Note:

- “Achievements to date” may include training, established programmes, established businesses, etc. and whether the achievements are documented in any report / brochure etc.
- “Partners” can include private companies involved, NGOs, etc.
- “Next steps” may include pipeline projects

Objective / Thematic Area	Activities	Status	Achievements to date	Partners	Challenges	Next steps
Strengthening governance frameworks	Preparation or Revision of national aquaculture plans and policies for up to 4 countries where required					
	Revision of preparation of National Legislation for up to 4 countries where needed					

Capacity Building	Short training seminars and Workshops on (i) Policy Development, (ii) risk analysis, (iii) quality assurance, value chain approach, (iv) fish farming as a business, (v) aquaculture extension, (vi) Recirculation System / aquaponics short course in University of the Virgin Islands					
	1-month Intensive Training Programme in Husbandry Practices of tropical aquaculture species.					
	1) 1 – 2-year MSc Aqua Programmes (6 candidates from the Caribbean). 2) 3 Year Ph D Programme in aquaculture (1 - 2 candidates from the region)					
	Production of series of key (training and lessons learning) videos related to Caribbean specific aquaculture placed on online platform.					
	Inter and intraregional working internship programme for both private and public sector participants					

	Development of curriculum for basic skills training in aquaculture targeting youth and piloting in 4 countries					
Strengthening Data Management and knowledge Sharing Systems for Aquaculture (build on existing regional knowledge platform)	Equipping Fisheries Departments and fish farmers associations and selected SME with Computer Facilities for collection, processing, storage and retrieval of data					
	Caribbean Aquaculture Conference and Trade Fair to promote knowledge exchange and opportunities in the region and Europe - Involving Caribbean and key European input e.g. (i) feed manufacturers and suppliers, (ii) General equipment - pumps, hapas hatchery etc (iii) Cage culture technology, and (iv) tropical aquaculture research including health management					

Aquaculture Suitability Surveys. (1 Site suitability surveys including GIS; and Production of portfolio of 5 economic viability studies for different prod systems	National GIS based surveys of biophysical, infrastructural and institutional factors to assess aquaculture potentials of country or region within country					
Strengthen Credit regimes	Access US\$10 million soft loan to Credit Unions to on-lend to fish farmers. This is best done as a revolving credit fund to targeting small to medium scale fish farmers with low interest rates					
	Access US\$25 million soft loan to on-lend to farmers to start-up fish farms					
Market Support	Market feasibility studies for indigenous and locally produced species					
	Market and Technical feasibility assessments of Ornamental Fish Culture					
R&D	Industry research local feed material substitution small scale fish farming					
	Institutional research reproductive biology indigenous and local species					
	Institutional Research Low trophic level species					

	(sea urchin, sea cucumber, blue land crab)					
Adaptation to Climate Change	Generation of disaster preparedness plan for sector					

The CRFM is an inter-governmental organization whose mission is to “Promote and facilitate the responsible utilization of the region’s fisheries and other aquatic resources for the economic and social benefits of the current and future population of the region”. The CRFM consists of three bodies – the Ministerial Council, the Caribbean Fisheries Forum and the CRFM Secretariat.

CRFM members are Anguilla, Antigua and Barbuda, The Bahamas, Barbados, Belize, Dominica, Grenada, Guyana, Haiti, Jamaica, Montserrat, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago and the Turks and Caicos Islands.

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