

Evidence-based and policy coherent Oceans Economy and Trade Strategies

BARBADOS

Sustainable Aquaculture

Fact Sheet¹

Draft-Not for Quotation

1. Introduction²

The project “Evidence-based and policy coherent Oceans Economy and Trade Strategies” aims to support developing countries such as Barbados, Belize and Costa Rica, in realizing trade and economic benefits from the sustainable use of marine resources within the framework of the 1982 United Nations Convention on the Law of the Sea (UNCLOS). This data factsheet presents detailed sectorial information of one (of the four) ocean sectors selected in Belize to facilitate the identification and informed selection of key sectors to be considered for the next phase of the project:

Sector 1	Sector 2	➔ Sector 3	Sector 4
Sustainable Marine fisheries	Seafood manufacturing	Sustainable Aquaculture	Coastal and Environmental Services

Aquaculture is the farming of aquatic organisms, such as fish, molluscs, crustaceans and aquatic plants (Adapted from FAO, 1998). Farming implies some form of intervention in the rearing process to enhance production, as well as individual or corporate ownership of the stock being cultivated in the planning, development and operation of aquaculture systems, sites, facilities and practices, and the production and transport (FAO Fisheries Department World Fisheries and Aquaculture Atlas (2003)).

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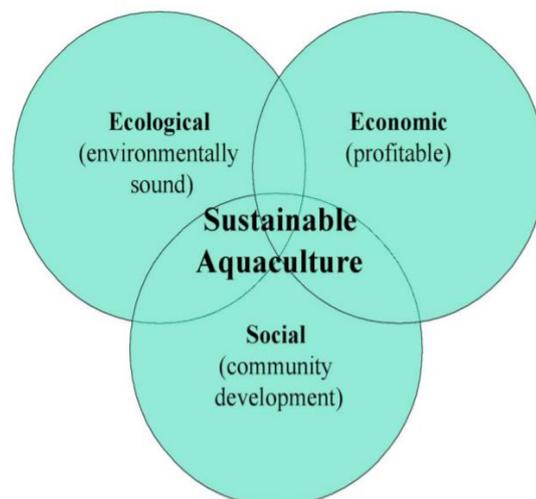
Recent years have seen the share of aquaculture products in total fish and fisheries products soaring. Aquaculture represented about a fourth of global fish production at the beginning of century. In 2016, the figure was set at 47 percent and the tendency remains an increasing one while that of marine production has been somewhat stagnating during the last 25 years. Competition on international markets is fierce and often dominated by Asian countries such as China, Vietnam or Thailand. The number of species that can be raised using aquaculture or mariculture techniques is limited making competition even more stringent.

In the case of Barbados, production remains extremely limited. Constraints are strong along several crucial dimensions as shown below. A somewhat puzzling situation is the strong incidence of import in domestic consumption. A high demand may be expected to create strong incentives to increase aquaculture production. However, this may not be the case.

Among possible and plausible constraints, sustainability needs to be considered as a major one. Indeed, the environmental impact of aquaculture is important as it is an industry intensive in water, land and diverse food inputs. It also requires labour and ecosystem services as primary inputs making sustainability of the activity a major challenge. Sustainable aquaculture should be interpreted as dynamic concept. Although there is no internationally agreed definition (Box 1) it should be based on an integrated approach encompassing ecological, economic and social aspects of development as shown in Figure 11. Therefore, sustainable aquaculture should in practice:

- Have in place a setting, methodology, and practices that do not create significant disruptions to the ecosystem, cause the loss of biodiversity, or lead to substantial pollution.
- Should yield sufficient food with little costs, little energy consumption, and little risks for the facility, fish, the environment, and the general population.
- Address the needs of the community in a socially responsible manner.

Figure 1: Sustainable Aquaculture and its Components



Source: White et al., 2004

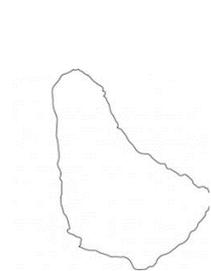
Box 1: What is “sustainable aquaculture”?

Although no internationally agreed definition exists, there are soft law obligations on “responsible aquaculture” in the FAO’s Code of Conduct for Responsible Fisheries that can provide detailed guidance based on the development of the ecological, economic and social development pillars. Some of the key aspects of a responsible aquaculture development according to the Code include:

- 1) Existence of an appropriate legal and administrative framework. In this regard, States should protect transboundary aquatic ecosystems by supporting responsible aquaculture practices within their national jurisdiction and by cooperation;
- 2) Availability of an advanced evaluation of the effects of aquaculture development on genetic diversity and ecosystem integrity, based on the best available scientific information;
- 3) Development of strategies and plans, as required, to ensure that the activity is ecologically sustainable and to allow the rational use of resources shared;
- 4) Ensure that the livelihoods of local communities, and their access to fishing grounds, are not negatively affected by aquaculture developments;
- 5) Set appropriate mechanisms, when required, to monitor the impacts of inputs used in aquaculture. Moreover, States should establish effective procedures specific to aquaculture to undertake appropriate environmental assessment and monitoring with the aim of minimizing adverse ecological changes and related economic and social consequences resulting from water extraction, land use, discharge of effluents, use of drugs and chemicals, and other aquaculture activities.
- 6) Introduce appropriate mechanisms, such as databases and information networks to collect, share and disseminate data related to their aquaculture activities.

The above points are extracted from Articles 9 and 10 of the FAO Code of Conduct for Responsible Fisheries (1995). The Code of Conduct was adopted by the FAO Conference in October 1995.

2. Geographical and Historical Context



There is currently no mariculture being practiced in Barbados and limited inland aquaculture production operations with a number of private individuals carrying out small-scale freshwater culture.

Like many other countries within the Lesser Antilles of the Caribbean, aquaculture development in Barbados is constrained by the following major factors:

- Limited availability of physical resources such as land, freshwater and soil suitability
- Suitable coastal areas for both freshwater aquaculture and mariculture operations;
- Competition for limited space particularly from tourism related activities

2.1 History of Barbados

Before 2000, there were a few attempts at aquaculture production such as: an inland government pilot tilapia farming project; a small-scale freshwater culture carried out by private individuals; rearing of dolphinfish, both imported and attempting to use captured local dolphins to spawn; and rearing of red drum using imported cultured eggs from the island of Martinique.

There have also been private, and government marine aquaculture attempts in the past; by a private sector individual which were relatively successful, and by the Fisheries Division to culture seamoss (*Gracilaria* spp.), which was imported from St. Lucia. However, for the latter, operations ceased due to a combination of factors such as theft and lack of interest by fisherfolk.

Since 2000, inland aquaculture has been slightly more successful with tilapia being reared from 2006 - 2015 at an inland location which has also unfortunately ceased due to the owner having to give back the land. There are currently **3 privately-owned** and operated farms in Barbados that produce and sell fish crop, one being a commercial tilapia production, while the other two are aquaponics farms, growing a mixture of vegetables alongside ***Tilapia, Red-bellied Pacu and Koi.***

Inland Aquaculture

An Aquaculture Pilot Project: The Greenland experimental fish farm was set-up by the Fisheries Division with support from USAID in the early 80's, to rear the Nile tilapia, *Oreochromis niloticus*. The idea was to assist interested farmers to start their own operation but the project was closed in 1989 due to inadequate water supply, frequent fish thefts and poor commitment to the management of the project.

Coastal aquaculture & Mariculture

At present no coastal aquaculture activities are being undertaken in the country. There was an interest by a number of individuals in culturing seamoss (*Gracilaria* spp.) in Martin's Bay, Conset Bay and a West Coast location. Experimental cultivation was initially started by the Fisheries Division in 1989 with a local strain of the seamoss being cultured using floating rafts on the West Coast. Unfortunately, all rafts were eventually stolen but preliminary results indicated that the seaweed grows well under the prevailing conditions on the west coast of the island.

Furthermore, Conset Bay on the East coast was identified as a feasible location for cultivation of sea moss. In December 2017, there was a regional workshop on seamoss farming sponsored by Blue Revolution to improve production and marketing of seamoss, which an individual from the Conset Bay community attended.

There is currently no mariculture as it competes with coastlines and nearshore that are filled with hotels and other tourist related activities. However, there were talks of a private pilot seamoss farming initiative being conducted on the West Coast of Barbados in 2018 and there appears to be potential to develop mariculture in offshore cages. Under the FAO's Climate Change Adaptation in the Fisheries Sector (CC4Fish Project), four manuals are being developed on seamoss farming.

3. Sector Trends

The focus in this section is on production recorded officially and on respective figures sent to International Organizations for publication. Consequently, only inland aquaculture production of freshwater species is informed.

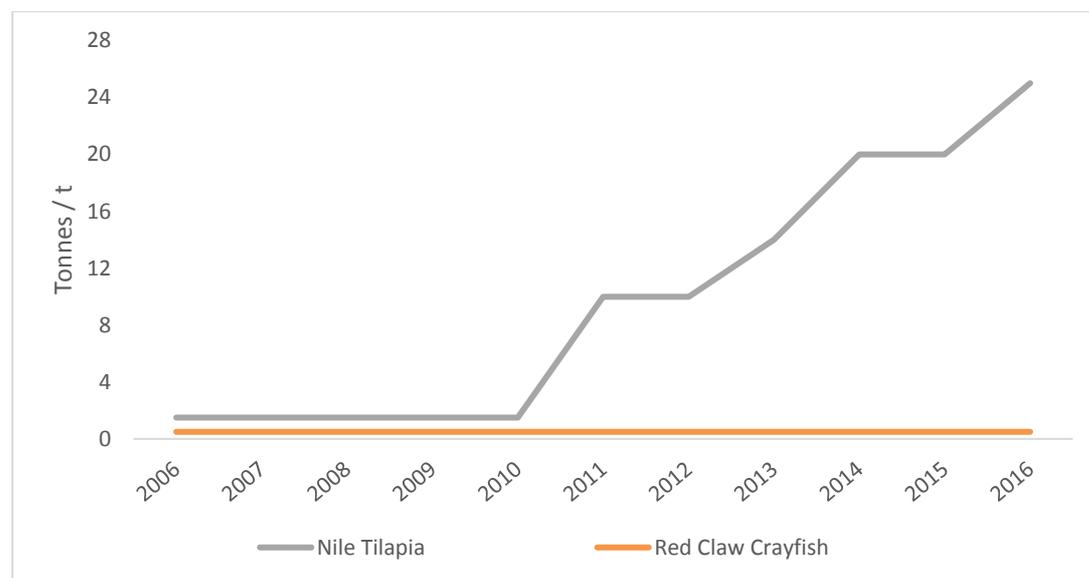
3.1 Production

FAO started producing statistics on Barbados inland freshwater aquaculture in 2006. with the production of two species, *red tilapia* (first introduced in the 1980's) *and red claw crayfish* which supplied the local market.

Available data reveals a small but fast-growing sector. Yet, all production is sold and consumed locally with no export. As mentioned in the previous section there are currently 3 privately-owned and operated farms that produce and sell fish crop.

In the period 2006-2016, aquaculture production has increased at an annual average rate of 29%. (Reported) production increased from 2 tonnes in 2006 to 26 tonnes in 2016, with Red Tilapia accounting for the vast majority of it (25 tonnes) (Figure 2). In the same year, the sector generated revenues amounting to 256'000 USD.

Figure 2: Aquaculture Production in Barbados between 2006 – 2016



Source: FAO FishStatJ, 2018

Note: Data are FAO estimates from available source of information or calculation based on FAO experts specific assumptions.

3.2 Employment

The largest aquaculture producing farm operating in the island *employs 2 people* (Table 1).

However, there are many small commercial aquaponics set ups and backyard producers, approximately *15 small commercial aquaponics* who sell to local market *and 50 backyard producers*.³

Adams Aquafarm is currently working with FAO on an aquaculture and visitor centre, and development of small aquaponics for the backyard.⁴

The farm sells tilapia whole fish at USD \$3.50-\$4/lb and used to sell fillets at USD \$7.50 but have discontinued selling the fillets. Crayfish sell at USD \$12.50/lb live weight.⁵

Table 1. Individuals conducting aquaponics production in Barbados.

Individual/Business	Number of employees
Kristina Adams/Adams Aqualife	2
Damian Hinkson, Baird Village Aquaponics	1
Cassandra Cain - Holligan	1
Everton Hoyte	1
Rondell Lynch	1
Ryan Medford	3

Source: Author's survey

5. Relevant International Regulatory Frameworks

There is no specific governing legislation for the aquaculture industry which is governed by default through various laws and regulations in other economic sectors. The most relevant International Trade Treaties are the following:

1. Trade Agreements

- a) World Trade Organisation (WTO) and goods and services related Uruguay Round Agreements (1994)
- b) The Economic Partnership Agreement between the EU and CARIFOURM (2008)
- c) Founding Member of CARICOM and the Member of the Central American Integration System (SICA)
- d) Various Free Trade Agreements with Colombia, Costa Rica, Cuba, Dominican Republic, Guatemala and Venezuela.

³ These are non-official data. Estimates are based on personal conversations with the producers.

⁴ For a description of the activity see <https://www.facebook.com/adamsaqualife/>

⁵ These are non-official data. Estimates are based on personal conversations with the producers.

2. Law of the Sea (for further analysis of the law of the sea and multilateral environmental agreements, see study on the law of the sea, regulatory and governance framework in selected ocean-based sectors by UNCTAD-DOALOS (2018).
 - a) Convention on the Law of the Sea (1982)
 - b) The United Nations Fish Stocks Agreement (1995)
3. Fisheries Regional bodies relevant to aquaculture
 - a) Latin American Organization for Fisheries Development (OLDEPESCA)
 - b) Central America Fisheries and Aquaculture Organization (OSPESCA)
 - c) Caribbean Regional Fisheries Mechanism (CRFM)
4. Environment:
 - a) Convention on Biological Diversity (1992)
 - b) Convention on International Trade in Endangered Species of Wild Fauna and Flora (1975).

4. Challenges and Opportunities

Despite the prediction of a significant expansion of aquaculture and mariculture production in Latin America and the Caribbean (LAC), Barbados has seen slow progress in this area. Despite some favourable tropical conditions such as a high temperature and salinity that could aid the development of aquaculture and mariculture factors such as the irregularity of rainfall, frequent droughts during the dry season and the location of Barbados in the hurricane belt compound their development. Moreover, although aquaculture products have generally favourable market conditions, the acceptability of some cultured species has been low as Barbadians have a preference of taste for marine fish. But these elements may not be enough to explain the current state of non-capture fish production in Barbados.

Aquaculture

Since the early 1980's, there has been commitment by Governments in the Caribbean to extend fish production from capture fisheries to aquaculture. However, unlike Belize and Jamaica for example that are at a commercial phase of development, Barbados is still at an experimental stage.

The development and implementation of pilot projects based on viable economic models, in order to validate and adopt if and where necessary the technologies available has already provided important information about feasible schemes.

A FAO Technical Cooperation Project (TCP/BAR/9151) was carried out in 1991 aimed at assessing the feasibility of aquaculture development in Barbados. Much of the work conducted in this project remains relevant as there are some common factors to the Caribbean that influence future aquaculture production.

Currently, the scope to expand sustainable aquaculture for both domestic and external consumption is limited in Barbados due to land and coastal space as well as freshwater supply limitations. With regards to the land, the limited supply of both freshwater and suitable soil type are major constraints to further development. In addition, the permeable nature of coral rock, which forms over 80% of the island, causes the almost complete lack of surface run-off, especially during the dry season.

There are also high rates of evaporation which make fresh water pond culture difficult. Construction of ponds which must be excavated to depths sufficient to provide adequate reserves of water to compensate for evaporation are costly. From both a technical and economic perspective, semi-intensive pond culture on a commercially viable scale has been deemed to be infeasible (FAO, 1991).

The culture of tilapia in land-based concrete tanks, however, still has some potential (CRFM, 2014) which has been reinforced by the slight shift towards the adoption of tilapia has been noticed. Further development of this sector would require additional marketing on these species.

Mariculture

In principle, Barbados appears to be more suited to mariculture. With regards to the potential species to be reared and taking into account the physical factors that greatly determine the possibility of commercial aquaculture development in Barbados, there is some potential that may exist for the following types of culture:

- bivalve culture along the south and west coast such as raft culture of oysters (which are already being reared in Jamaica, CRFM, 2014) or the potential of the south American rock mussel (*Perna perna*) which is heavily exploited in Venezuela and Trinidad (FAO, 1993).
- rearing of juvenile queen conch (*Strombus gigas*) for reseeding of shallow water areas;
- seamoss (*Gracilaria* spp.) cultivation using long-lines;
- cage culture for dolphin fish.

Before dropping the idea of expanding inland aquaculture and mariculture an updated and detailed study to determine feasibility for production of selected species considering the combination of unfavourable conditions and associated factors that limit the type of aquaculture and the species that can be reared is clearly necessary. Such study goes beyond the scope of the synthetic analysis undertaken here and would require some significant investment of resources.

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