

Sustainable Aquaculture

Development of an Aquaculture Industry in Seychelles

(on-going)

Summary

Fishing plays an important role in the Seychelles economy, with a fishing industry worth around US\$400 million and per capita fish consumption levels more than twice the global average. Despite this, aquaculture has been slow to develop. However, there is a renewed focus on building a sustainable mariculture sector through the Blue Economy Strategic Framework and Roadmap, launched in 2018.

The Seychelles Fishing Authority (SFA) is coordinating efforts to develop marine finfish and marine invertebrate farms in line with the United Nations Food and Agricultural Organization (FAO) Ecosystem Approach to Aquaculture. Background work has been ongoing for the past 10 years, including the publication of a Mariculture Master Plan and developing a regulatory framework, zoning and feasibility studies followed by an Environment and Social Impact Assessment (ESIA) in 2016.

The implementation plan focuses on production of high-value finfish and invertebrates including snappers, groupers, sea urchins and sea cucumbers. Zoning has identified areas suitable for aquaculture production including artisanal systems, commercial systems (covered by the ESIA) and commercial zones requiring separate impact assessments. A legal framework has been established and mandatory aquaculture standards developed while market research has been carried out.

Key infrastructure has been developed, including a broodstock acclimation and quarantine facility in Providence, Mahe. This is important as Seychelles will focus on indigenous species to reduce the risk of disease transfers and escapes of exotic species. A sea urchin research facility has also been established in Providence, and a pilot-scale cage aquaculture site. A research and development centre is planned for La Digue Island and an integrated aquaculture hub at Grand Anse, Mahe.



Broodstock acclimation and quarantine facility, Providence

Aquaculture regulations are currently being drafted into legal texts for gazetting, which will allow the official launch of the sector later in 2020. SFA has been involved in a public education and awareness campaign, and local and international investors have shown an interest.

The Blue Economy initiative has provided an opportunity to prioritise sustainable aquaculture as a means to diversify ocean-based activities. In the future, aquaculture has the potential to become a new pillar of the economy.

The issue

Fish and fish-related activities play an important role in the economy of Seychelles, making up 7.6 per cent of gross domestic product (GDP) in 2018, worth US\$400 million and employing around 5,000 people. Per capita consumption of fish is the highest in Africa at 57.4 kg/person/year (FAO, 2014). In order to focus on sustainable investment in an ocean-based economy, Seychelles launched a Blue Economy Strategic Framework and Roadmap after approval by the Government on 31 January 2018. A Blue Economy Department has been established within the portfolio of the Office of the Vice President to oversee implementation of the Framework and Roadmap.

The goals in developing the national Blue Economy Roadmap include economic diversification and resilience to reduce economic vulnerability and reliance on a small number of sectors and to increase the share of GDP derived from marine sectors; shared prosperity through creation of high-value jobs and local investment opportunities; improved food security and well-being; increased integrity of habitats and ecosystem services; sustainable use; and climate resilience.

The two main pillars of the economy are tourism and the capture fisheries industry. Tourism is volatile and largely dependent on the global economy whereas capture fisheries are overexploited and some species are declining. The 2008 global economic crisis hit Seychelles hard economically, and the aftermath led the Government to decide that the country needed to diversify its economy.

One of the key opportunities was the exploration and feasibility of new and emerging maritime sectors, including marine-based aquaculture. Previously, Seychelles had a commercial prawn farm, which was state-owned, with production peaking at over 1,000 tons in 2003/04. The farm grew black tiger prawns (*Penaeus monodon*), with the seedlings and broodstock coming from hatcheries in Madagascar and Mozambique. The prawn farm had to shut down in December 2008, for economic and operational reasons. The only remaining aquaculture facility is one on the second largest island of the Seychelles Archipelago: Praslin. The Black Pearl Farm is privately owned and has been in operation since the 1980s, when it started with both black pearl (*Pinctada margaritifera*) and giant clam (*Tridacna maxima*) production. Giant clam production had to cease in the early 2000s because of high mortality during transportation to markets in Europe and the USA. Aquaculture in general had not been a significant economic activity in Seychelles at that point, and skills, key infrastructure, institutional and legal frameworks were lacking.

The response

The Seychelles aquaculture sector is being developed according to the United Nations Food and Agricultural Organization (FAO) 2010 Ecosystem Approach to Aquaculture – a strategy for the integration of the activity within the wider ecosystem such that it promotes sustainable development, equity and resilience of interlinked social-ecological systems.

The process started with a 2007 Rapid Assessment Study to gauge opinion on whether it was desirable to develop marine aquaculture, followed by a 2009 Comprehensive Scoping Study to assess opportunities and constraints and the publication of a Mariculture Master Plan (MMP) in 2011. Work continued on developing the regulatory framework, the identification of Aquaculture Development Zones (ADZs), feasibility studies and environmental baseline studies over the period until 2016.

In 2016 an independent consultancy firm, Golder International, carried out an Environment and Social Impact Assessment (ESIA). The consultants' task was to determine the potential positive and negative impacts of the proposed MMP on both the biophysical and socio-cultural environments as a consequence of the creation of such an industry. The ESIA evaluated impacts and recommended mitigation measures to either avoid or reduce negative impacts and enhance positive impacts of the MMP. The conclusion and opinion of the consultants was that:

"Subject to compliance with the recommended mitigation measures, which are detailed in the ESMP [Environmental and Social Management Plan], the proposed new aquaculture sector has significant positive aspects and acceptably low negative biophysical and socio-cultural impacts which can be managed by suitable monitoring and management interventions. It is the opinion of the EAP that it should be approved on the basis that overall the positive impacts outweigh the negative impacts."

With environmental approval, the Aquaculture Department was ready to transition from a planning phase to an implementation phase.

Seychelles' emerging aquaculture industry seeks to incorporate a diversity of candidate species and production technologies with the aim of providing a premium-quality basket of seafood products to both local and export markets. There is an opportunity to develop a high-quality mariculture industry based on production of marine finfish and marine invertebrates. Candidate species for production have been identified and research is continuing into diversification of the range of key species.

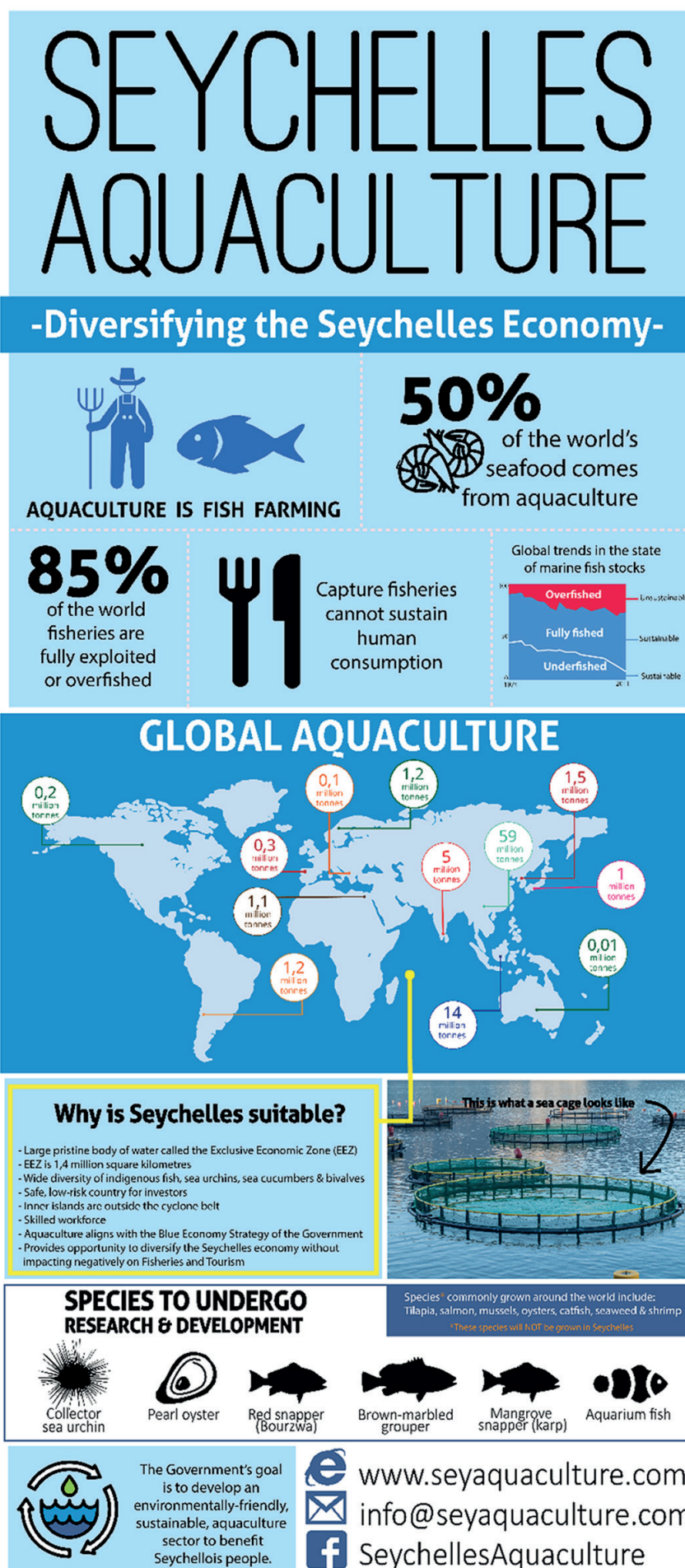
There is a five-year implementation plan, as follows:

- Focus on high-value species, e.g. snappers, groupers and other finfish;
- Total coastal area identified for production: 52 km²;
- Estimated average potential production for 5.2 km² = up to 50,000 MT (capacity);
- Job creation = approximately 2,000;
- New export markets (Japan and Southeast Asia);
- Potential for investment - fish feed production;
- Potential for collaboration in e.g. research and development (R&D).

Partnerships and support

The various partners involved in the development of aquaculture in Seychelles are:

- The Ministry of Fisheries and Agriculture (MFAg) is the lead ministry in developing aquaculture and provides policy guidelines to this sector through the Seychelles Fishing Authority (SFA).
- The Blue Economy Department coordinates development in the Blue Economy sphere and ensures cohesiveness on subjects such as food security and economic development.
- The Seychelles Conservation and Climate Adaptation Trust (SEYCCAT) is a local trust fund set up as part of the debt swap agreement for Seychelles, to assist small local entrepreneurs to develop and start activities in the Blue Economy of Seychelles, which includes aquaculture.
- The Ministry of Environment, Energy and Climate Change (MEECC) assists SFA in assessing and approving aquaculture projects and ensuring adherence to Seychelles' environmental laws.



Source: Aquaculture development context in Seychelles (2017). Since then, the percentage of fisheries fully exploited or overfished has risen to 94% (FAO SOFIA 2020)

- The Ministry of Finance, Trade and Economic Planning (MFTEP) assists in the national development of aquaculture with a particular focus on finance and trade policies.
- The National Institution for Science, Technology and Innovation (NISTI) is charged with assisting with any potential innovation coming out of aquaculture development in Seychelles.
- The Ministry of Employment helps the aquaculture sector develop while keeping in line and up to date with the various employment policies to ensure the socio-economic impact of the sector is kept on a positive side,
- The Guy Morel Institute (TGMI) is a leading educational institute partnering with SFA to train skilled labour for the sector with a particular focus also on entrepreneurship.
- The Seychelles Investment Board (SIB) is the point of contact for any businesses wishing to invest within or from outside Seychelles and is assisting SFA to market aquaculture.
- The Department of Investment assists SFA with investment-driven policies to ensure the sustainability of the sector in years to come as the global investment climate changes.
- Entrepreneurship Development and Business Innovation is a unit within TGMI and the University of Seychelles is the dedicated government-owned tertiary education institute, both partnering with SFA to conduct scientific research.
- Aquaculture Biosecurity and Fish Health Management in Land- and Sea-based Facilities;
- Responsible Prawn Farming in Ponds;
- Responsible Pearl Oyster Farming;
- Responsible Sea Cucumber Farming, Ranching and Stock Enhancement.
- ADZs have been established to fit with the recommendations of the 2016 ESIA. The ESIA covered some land-based sites and specific ADZs, but did not include inshore and offshore zones.
- Market research was carried out in 2015–2019, including study visits to Taiwan, Japan, Hong Kong, Thailand, Singapore and Norway, with the aim of ground-truthing market assumptions and identifying potential development partners.

Development and implementation of the MMP was assisted by an experienced team of consultants (Advance Africa), including an Emeritus professor of ichthyology and an agricultural/resource economist, who various scientific and socio-economic surveys and modelling of the sector's impact on Seychelles.

Results, accomplishments and outcomes

Aquaculture development and activities in Seychelles are now governed by the 2014 Fisheries Act, the Regulations for Aquaculture in the Seychelles (pending Official Gazetting) and the Seychelles Aquaculture Standards. The Standards are designed to provide detail to the Aquaculture Regulations and are mandatory. They cover the following issues:

- Aquaculture in Sustainable Use Areas;
- Responsible Finfish Cage Culture;
- Responsible Effluent and Waste Management;

A multi-species broodstock acclimation and quarantine facility (BAQF) has been established in Providence, Mahe, to provide scientific and institutional support to aquaculture operators by developing hatchery techniques and producing fingerlings to supply fish farms. Seychelles is taking an approach of using only indigenous species in this new sector, so as to negate the risk of importing diseases and other biosecurity issues. With this approach, and with limited land and human resources, among others, the Government will house and manage the main finfish hatchery on the island. This will benefit start-up businesses, as they can purchase good quality fingerlings at a subsidised rate.

Also in Providence, a sea urchin research facility (SURF) has been set up to develop production protocols for collector sea urchins (*Tripneustes gratilla*) and investigate markets and distribution networks for Uni, a product derived from the gonads (roe) that is in high demand in Japan. The research facility is located at the Seychelles Maritime Academy (SMA), a post-secondary school. SFA has been able to sign a memorandum of understanding with the school so that the students can occasionally participate in the research, thus building their capacity for the world of work.

A sea cage site has been identified off the coast of Providence and close to the BAQF to hold fingerlings and carry out pilot-scale grow-out of marine finfish. Two "Polarcirkel" sea cages have been installed with the help of a Norwegian company. This will be used to prove the business case for marine finfish farming in Seychelles as well as studying environmental impacts of cage farming on the seabed.

Plans are at an advanced stage for an R&D centre on La Digue Island. This will be a multi-species centre for fisheries and aquaculture focused on new species, aquaculture production techniques and nutrition research. It will also include coral reef

conservation, climate change, restocking research and a public aquarium.

An integrated aquaculture hub will be developed at Grand Anse, Mahe, with the aim of carrying out research on integrated systems using a number of different fish and invertebrate species and including marine ornamental fish hatchery and production.

At present, this is a Government-led strategy. As Seychelles is a small island developing state, most people do not have the necessary resources to start aquaculture on their own. The Government thus needs to assist by providing services such as centralised infrastructure, fingerlings, expertise, etc.

This approach is similar to that in the fisheries sector, whereby the Government spearheads the initiative and supports development, providing a mechanism to start the ball rolling. Once the sector is fully fledged, then some components, such as the government hatcheries (BAQF Phase 2), will be considered for private–public partnership (PPP) or privately run. On the other hand, the broodstock component (BAQF Phase1) will remain Government-owned as it will house the country's genetic bank of important flagship species, to ensure small operators are not compromised in their access to inputs as the sector grows.

Challenges

MFAg has reviewed the Aquaculture Sector Plan and published a Fisheries Sector Plan in late 2019 that synergises with this. Additionally, now the Fisheries Policy and Strategy 2019 now aligns well with the Aquaculture Policy 2018

Aquaculture Regulations are currently being drafted into legal texts before being published in the Official Gazette to allow for the launch of the industry.

Human resources development is on-going through various local and international training. SFA has funded and facilitated the training of both government and private sector staff. Training in subjects such as fish health management has benefited veterinarians, giving them the competence to deal with fish-related diseases or health issues. Sea urchin production training has enabled SFA staff to be able to run the sea urchin experiments at SURF.

SFA has embarked on an education and awareness campaign since 2017, whereby it gives talks to various classes at the different schools on the main three islands and also the general public. Lots of educational materials such as posters and videos have been developed for this campaign. The different ministries in Seychelles organize several fairs throughout the year, in which SFA participates to educate the wider population on aquaculture and the opportunities it brings, but also to

openly discuss the negative sides of aquaculture. The SFA office also has an open door policy whereby people can drop by for a discussion at any point during normal working hours.

There has been investment interest by several local and foreign investors but for the time being no investment has taken place, since the Aquaculture Regulations have not yet been promulgated.

Seychelles now has a BAQF but no hatchery, thus, if the finfish starts spawning, there will no hatchery for the larval stage. The lack of a hatchery will affect the ability to start producing larvae and fingerlings for the industry and slow the anticipated pace. This will also affect the plan for implementation and usage of the two sea cages.

Previous mariculture failures, such as the prawn farm, have taught the country a great deal in terms of simple factors such as proper site selection, surveys, market analysis and alignment with global development. Preparation of the legislative framework has been an important step in avoiding repeating the same mistakes at a time when there was a lack of proper regulations and standards in place to ensure operators were implementing best management practices and conforming with regulations. However, existing farms, such as the pearl oyster farm, have had to wait until the legislative framework is complete before they can carry out any new developments, as they will need to re-register and adhere to new standards.

This has been a long process, taking around a decade so far. Many baseline studies have had to be conducted, regulations and standards have had to be drafted and there was scarce funding in the implementation phase (from 2015) when expensive infrastructure-based activities were implemented. Also, legislation was outdated and sometimes conflicting with what was needed for the aquaculture sector. Identification of suitable sites was also difficult. On the other hand, the delays also helped in some ways. For example, some assumptions at the beginning over target candidate species changed over time as production increased in other countries, leading to falling market prices, making these species no longer attractive for Seychelles.

New feed developments have also been important, with lower feed conversion ratios and replacement of fish-based raw materials by plant-based alternatives. This has allowed the focus to change and enabled the adoption of new and more modern methods targeting economically more appealing and high-value species. Also, it has provided more confidence in the way aquaculture operates while addressing environmental concerns that were more of an issue 10 years ago.

The biggest advantage has been that no new aquaculture licenses have been issued over this period, meaning that, when the sector is opened up, all new and existing

applicants will have to abide by the new regulations. This is in contrast with the Seychelles fisheries sector, which is struggling to get fishers to register their activities as proper businesses, use electronic reporting and adopt best management practices from fisheries management plans (only one has been recently approved over thirty years).

In summary, the delay has not been negative. On the contrary, lessons have been learnt and strategies are in place to ensure optimal results will be achieved when the Aquaculture Regulations are launched.

Key lessons learnt

Seychelles depends heavily on the ocean for food security and economic development so there has been strong support to developing sustainable aquaculture as a means to diversify the economy.

The Blue Economy initiative has placed emphasis on economic diversification, providing an opportunity to prioritise aquaculture development alongside other ocean-based initiatives.

The research commissioned by the initiative has shown that aquaculture has the potential to become a new pillar of the economy. However, this is a long-term objective.

Lead contact

Aubrey Lesperance, Principal Aquaculture Officer,
Seychelles Fishing Authority

Email: alesperance@sfa.sc

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**The Commonwealth
Blue Charter**

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Commonwealth Secretariat
Marlborough House, Pall Mall, London SW1Y 5HX, United Kingdom
Tel: **+44 (0)20 7747 6500**
www.thecommonwealth.org

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