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PROMOTING REGIONAL TRADE AND AGRIBUSINESS DEVELOPMENT IN THE CARIBBEAN

STUDY ON LINKING FISHERIES TO TOURISM-RELATED MARKETS:

BARBADOS

Second draft

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Contents

Abbreviations and acronyms

BARNUFO	Barbados National Union of Fisherfolk Organisations
BMT	Barbados Marine Trust
BSTP	Barbados Sea Turtle Project
EU	European Union
FAD	Fishing Aggregation Device
GDP	Gross Domestic Product
CRFM	Caribbean Regional Fisheries Mechanism
CZMU	Coastal Zone Management Unit
HACCP	Hazard Analysis Critical Control Point
IICA	Inter-American Institute for in Agriculture
IUU	Illegal, Unreported and Unregulated
SOP	Standard Operating Procedures
SSOP	Sanitization Standard Operating Procedures
SPS	Sanitary and Phyto-Sanitary
UWI	University of the West Indies

1 Introduction

Caribbean islands depend highly on tourism for their economy and the sector is a huge contributor to the economies of all Caribbean countries. It provides a steady revenue stream, and supports local farming, fishing, and retail industries. The island population in the Caribbean is more dependent on income from tourism than in any other part of the world relative to its size. In 2014 travel and tourism directly supported more than 13.0% of total employment, with the sector contributing US$ 16.1 billion to the Gross Domestic Product (GDP). In Barbados the tourism sector is even more essential as, while the direct contribution of the sector to the GDP is 11%, the total contribution of travel and tourism to GDP was 36 % of GDP in 2014.[1] The sector directly supported 14,000 jobs (11.1% of total employment). It plays a key role in the economy and has a positive "spin-off" impact on virtually all other business sectors. Indirectly the sector supports 36% of the total employment in Barbados. This includes jobs in hotels and restaurants, travel agents, airlines and other passenger transportation services but also includes, for example, the activities of leisure industries directly supported by tourists (e.g. catamaran cruises). Barbados has thus moved from a previous primarily agricultural economy to a service-based economy that supports tourism.

Twenty-five million tourists choose to holiday in the Caribbean each year with its climate and the coastal and marine environment being one of the main attractions. Dependence on tourism therefore also implies dependence on the capacity of the marine ecosystems to continue providing the services, goods and conditions which make the region such a popular vacation destination.

The fisheries sector in Barbados is important as it supplies a range of goods and services, including food security, recreation opportunities and ecosystem services (Moore et al. 2014). It provides livelihood and employment, tax revenues, as well as foreign exchange through exports as well as foreign exchange savings from reduced food imports (Mahon et al., 2007). The fisheries sector is important for the tourism industry both directly as well as indirectly and for consumption as well as recreational purposes. Flyingfish, dolphinfish, kingfish and tuna are, for example, constant favorites with visitors. Barbados is known as "the land of the flying fish", and the fish is one of the national symbols of the country. The one dollar coin, for example, bears an image of a flying fish and the Barbados' national dish is coucou and flying fish.

However, some 54 percent of the commercially harvested fisheries stocks in the Caribbean Region are overexploited or depleted and an estimated 41 percent of the stocks are fully exploited at present[2]. The inshore fishery in Barbados is considered to be fully or overexploited (McConney, 2011; Vallès and Oxenford, 2012). The deep-slope and bank reef fishery may be fully exploited in some areas, but not in others while there is lack of information on the coastal pelagic fishery (McConney, 2011).

The sector provides direct employment to approximately 2,200 persons, while supplying livelihood and employment to approximately 6,000 in total people who catch, sell and process fish (McConney, 2011). This number, however, excludes those involved in cooking, serving fish, whether in exclusive restaurants, at *Fish Frys* or the numerous rum shops across the island.[3] However, as for the eastern Caribbean in general, the true value of the fishing industry is seldom accurately estimated due to deficiencies in available information on catches and prices (Mahon

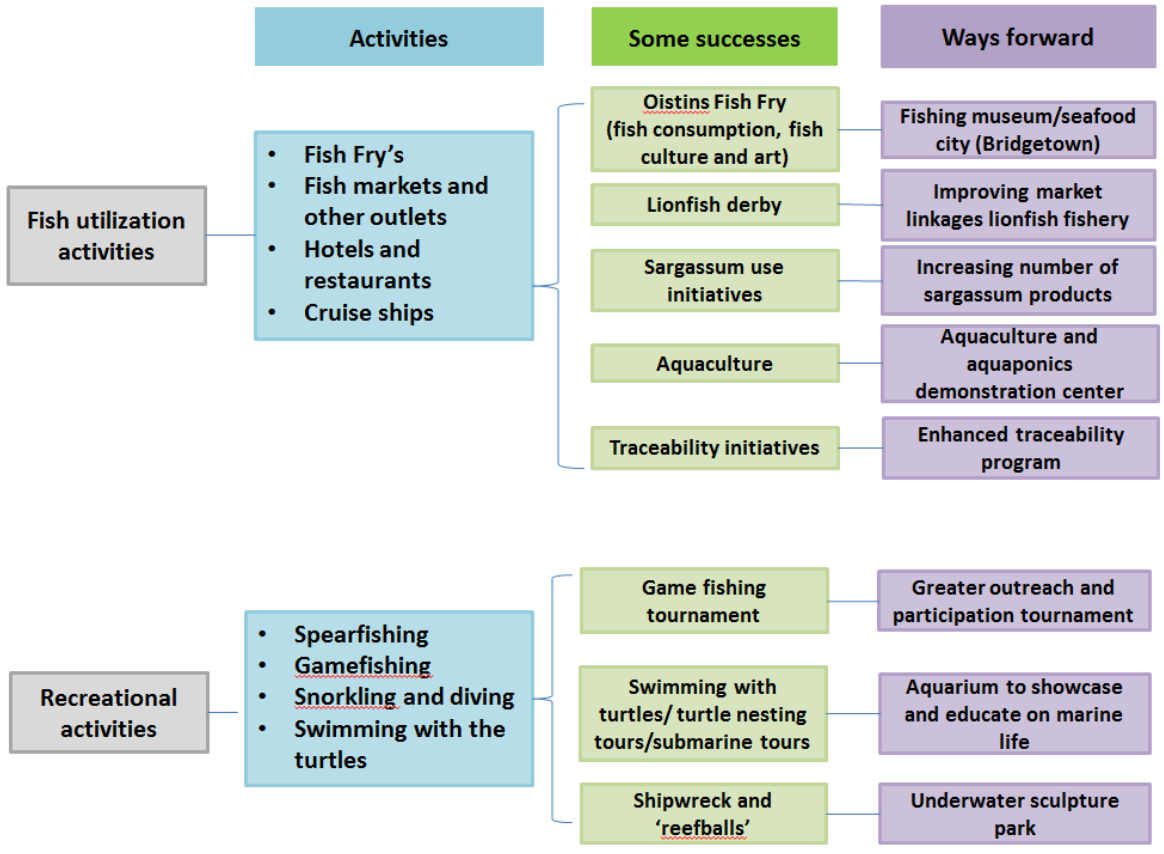
[1] WTTC Barbados 2015
[2] FAO (2014). The Sustainable Intensification of Caribbean Fisheries and Aquaculture. Factsheet 3
[3] It also excludes those associated with the fishing industry through supporting services such as boat building, and the sale and maintenance of boats, boat engines, fishing tackle and electronic equipment (Mahon et al., 2007)

et al., 2007). The true contribution of fisheries to the Barbadian economy is therefore not exactly known but is expected to be much higher than the figures mentioned above.

Fisheries and tourism are thus two important drivers of the country's economy. The linkages between the two sectors can be categorized into two general categories: *fish utilization* activities and *recreational* activities. The links between the two productive sectors is not always recognized while creating enhanced linkages and synergies is important to the growing tourism industry on the island.[4] However, the links between the fisheries and tourism sector can also be negative with e.g. conflicts with recreational divers and watersports operators and coastal development projects marginalizing fishers use of the coastal zone for landings and boatyard space (McConney, 2011). This report examines the main linkages between the two sectors in the country in order to identify successful cases of linkages between fish producers and processors with buyers in the tourist-related markets which can be up-scaled or replicated, the opportunities and challenges that exist, and provides ideas for new opportunities to create economic activities and jobs, reduce food import bills and foreign exchange outflows, in order to benefit coastal communities. The report will identify the knowledge gaps and support needed to strengthen links between the various actors in the value chain – small-scale farmers, processors, finance institutions and tourism and hospitality sector officials.

2 Successful linkages fisheries and tourism in Barbados

The tourism industry and fisheries sector in Barbados are linked in various ways and in this report they have been categorized in two general categories*: Fish utilization activities* and *Recreational activities* (see figure 1) and their direct and indirect uses. The categories and their components are further discussed below.



[4] WTTC Barbados 2015

Figure 1 Major linkages between the fisheries and tourism sector in Barbados

2.1 Successes in fish utilization in Barbados

2.1.1 Oistin's Fish Fry

Over the last 10 years the weekend *Fish Frys*, such as those in Oistins on the south coast and Half Moon Fort (Moon Town) on the West Coast, have emerged as major features in the country's tourism product and attract a large number of visitors who have the opportunity to interact with the many locals that patronize them (Mahon et al. 2007). It enhances economic benefits and adds some diversity to the islands' tourism product (Moore et al. 2014). In Oistins the main activity is the Bay Garden *Fish Fry's* on a Friday night attracting numerous visitors (the most popular day being Friday but other days are popular as well), offering a 'truly' Barbadian cultural dining experience with a street party setting for visitors and locals with karaoke and other festive activities as well as stalls with crafts and arts (see Figure 2-4). The consumption of a meal often includes fish and many local vendors sell various kinds of prepared fish and lobster from the grill and other forms of seafood-based cuisine supporting livelihoods of fisherfolk.

In 2009 fish landings in Barbados were approximately 3 467 MT. The local demand for fish in Barbados is very high and the local fish production is insufficient. Fish imports are therefore required and in 2009 imports were 5 362 MT which is in fact 155% of the domestic caught fish. High fish imports is common in the Caribbean region and in 2009 it was estimated that the CARICOM Member States imported approximately 70,037 mt of fish (48% of the production from marine capture fisheries plus aquaculture production of the region) (Masters, 2012).

According to various interviewees the majority (70%) of the fish sold at the Oistin's fish fry is therefore not local fish but actually frozen imported fish. This is a rough estimate the exact figures could fluctuate depending on the season and day of the week. Further research would be needed to examine the exact percentage and species composition. The majority of fish consumed is imported implying that further improvement for livelihoods and food security lies in improving the crafts and entertainment.

Figure 2: Oistin's *Fish Fry* on a Friday Night
Source: Aniya Legnaro

Figure 3: Fish on the grill at the Oistin's fish fry
Source: Aniya Legnaro

At the Oistin's *Fish Fry* there are a variety of arts and crafts stalls. At present, one vendor sells bowls made of ground up fish scales, producing a unique tourist product (figure 4). However, despite the claims by the vendors that these bowls are made locally, they appear to be mass produced in a factory (most likely Asia) and imported from elsewhere. The popularity of these bowls among tourists, however, suggests that there is a desire for locally made crafts made of fish waste products and new routes should be investigated(e.g. fish leather products)

Figure 4: Bowls made of ground up fish scales
Source: Aniya Legnaro

The Oistin's *Fish Fry,* as well as the other *Fish Fry's*, have been successful in attracting people and showcasing the local fishery of Barbados to tourist while providing benefits to the fishing community.

2.1.2 Fishermen's week

Fishermen's week is a week full of activities for fisherfolk and those associated with the industry, as well as for outsiders. The week's celebrations include a memorial church service to remember all those who lost their lives at sea as well as presentations for fishermen on a variety of topics and various entertainment activities. In 2014 there were presentations on: Law of the Sea; Market Information System for the Fishing Industry; and G.P.S Tracker for Maritime Tracker industry. In 2014 there were also presentations and discussions: fish handling and quality control; risk management in the fisheries sector and the Ecosystem-Based Approach (see figure 5). In 2015 Fishermen's week was significantly downscaled due to crisis in the fishery [resulting from persistent presence of sargassum. As a result fisherfolk lacked the financial resources required. The celebration also showcases a variety of local and regional delicacies, art & craft, live music and cultural entertainment such as the steel-pan and Tuk-band (a Barbadian musical ensemble) but also karaoke (in Oistins). Some of the main attractions are the fish boning competition, the climb-the-grease-pole competition as well as the crab racing and boat racing competition. These activities could be broadened to attract and educate tourists. The Tuk band, stilt walking and limbo dancing during the Oistin's Fish Festival have been identified as needing further cultural development (Leslie, 2010)

Figure 5: Poster of fishermen's week and boning competition
Source: Fisheries Division

2.1.3 Lionfish derby

Lionfish are an invasive species in the region and now being spotted in the waters around the entire island of Barbados. Lionfish negatively affect native fish stocks and decreasing their abundance is therefore crucial. The first lionfish sighting in Barbados was in 2011. This has resulted in the implementation of the Lionfish Response Plan which was drafted by the Natural Heritage Department in collaboration with the Fisheries Division, the Coastal Zone Management

Unit (CZMU) and the University of the West Indies (UWI). The response plan has several elements including research, eradication strategy and creating public awareness. *Public awareness* was created by means of newspaper articles, workshop (giving information, training in capture and safe handling, food preparation), and production of brochures, a facebook page and a lion fish hotline. As part of the *Eradication Strategy* various activities were undertaken and lionfish derbies and cook-ups were undertaken to encourage market and public awareness (see Figure 6 and 7).

Figure 6a and b: Lion fish landed and cooked at the 2014 derby
Source: CZMU

Figure 7: Flyer of lion fish derby in Barbados in 2014 (7a) and 2015(7b)
Source: CZMU

In 2014 a successful lionfish derby was carried out by the CZMU. The lion fish derby is a large-scale cull where divers and fishermen would compete to catch as many of the predatory fish as possible during the contest. In addition, culinary chefs from well-known restaurants prepare the lionfish afterwards to introduce the lionfish as food (see figure 7). It has proved successful as people realized the taste of lionfish is excellent. In fact, one of the interviewees indicated that divers who catch lionfish will not sell the product but prefer to eat it due to its superb taste. Derby's are also a way to improve the linkages between the fishers and the hospitality industry as chefs learn to prepare and work with lion fish. For 2015 the Lion Fish derby will be organized by the private sector rather than the public sector, with the brand REEF in collaboration with PADI organizing the Derby on the 5-6 December 2015. This derby included some of Barbados

most respected hoteliers, chefs, environmental, and scuba diving experts. It aims not only to help to preserve the reefs, which the lionfish infestation is threatening, but is also geared towards helping to create a new sustainable aspect of fisheries in this country. Lionfish could become a structural component of the menu of restaurants tourists enjoy. However there is still a continuous discrepancy between market and supply. The fluctuation of supply in the market is a major constraint to put lionfish on the menu while simultaneously the uncertainty in demand is a constraint to catch lionfish. It is important to continue efforts to control the lionfish in the region, including Barbados. This involves continued efforts in training of fisherfolk in fish handling of lionfish as this provides a significant obstacle to fishers (Fisheries Division has supported this with an initiative at the AgroFest 2015 as well as some private dive operators but significantly more training needs to be carried. It is also important to improve the public awareness by holding workshops with local chefs on safe preparation of lion fish as many chefs are still unfamiliar with the myriad ways lionfish could be prepared and encourage more lionfish derby's to improve public awareness and .

2.1.4 Aquaculture developments

Aquaculture (freshwater, brackish water and marine) is globally the fastest growing food-producing sector, and the latest figures for worldwide aquaculture show that it contributes 42 percent of total fish production for human consumption (FAO, 2014). Aquaculture has become increasingly important in meeting the deficit created by declining capture fisheries and is trying to meet the increasing demand for fish in domestic and international markets due to lifestyle and economic factors. Aquaculture could assist in the Eastern Caribbean in terms of food security, employment and foreign exchange earnings are still underdeveloped. The aquaculture sector is in the Caribbean in general is not well developed, with significant development limited to the larger Caribbean countries. In value Trinidad and Tobago, Belize, and Jamaica are the largest producers (Masters, 2012).

In the Caribbean region the import of fish and fisheries products shows a steep rise, with an increase of 35 percent in just over a decade. Fish imports are currently about 10 times higher than aquaculture production. The continuing increase in population in the region together with the impact of a more demanding tourism industry and the ongoing promotion of a healthier lifestyles and diets, spurs demand for healthy, safe and high quality food including fish and fisheries and aquaculture products. Considering that Barbados imports more fish than it produces, there is certainly scope for the aquaculture sector in terms of import substitution.

Barbados is considered an good candidate for aquaculture farms due to the climate which allows year round production, the proximity to both local and foreign markets and the fact fish demand greatly surpasses market supply. If developed properly, aquaculture can become a major producer of fresh fish on the island, creating food security, employment, foreign exchange, and a lower fish import bill. . However, aquaculture is also capital intensive, requires a high level of technical know-how and can be water and energy intensive. Scarcity of suitable land can also pose challenges for aquaculture development in Barbados.

Figure 8: Kristina Adams, the owner of Adams Aquafarm, with a crayfish
Source: Author

Tilapia farming is considered a worthy option as it is a fast maturing fish, relatively easy to manage, is popular with consumers and is nutritious. Adams Aquafarm, owned by Kristina Adams (Figure 8), is a commercial aquaculture farm producing Red Tilapia and Crayfish for the food industry in Barbados. The farm was set up in 2005 and initially imported the Red Tilapia broodstock in 2006. Since then she has been able to multiply this stock and has not had the need to import further. She has seen a steep increase in production over the last two years as a result of increased external investments after she won the national 'Bank on me" TV show. She produces Red Tilapia, which is a hybrid species of three different types of tilapia, for the local hotel and restaurant industry. It looks similar to snapper and is therefore often sold as 'cherry snapper' or 'freshwater snapper' as well as supermarkets. Adams Aquafarm does not sell directly to the local hotel and restaurant industry but sells through a processor where the fish is processed. The farm produces approximately 1MT of tilapia monthly (Figure 9a), of which 70% is sold as filet whereas 30% is sold as whole fish. She is currently expanding into producing Red Claw Crayfish, an Australian species and produces approximately 0.5 MT of crayfish a month (Figure 9b).

Fig 9a and b: Cray fish tanks and Tilapia tanks

Adams Aquafarm has engaged in some tours for students and tourists as well as summer camps for young adults to learn more about aquaculture. A large number of tourists visit Barbados every year. A number of these tourists are interested and would want to learn where the seafood they consume comes from. This interest, linked with the current surge to buy local and buy fresh

(see for example the recent "slow food" flyer in figure 10b) has created a positive climate for any ventures that connect tourists with aquafarms. Developing interactive tours for tourists (and schools) to visit the aquafarm whereby visitors are learned on all aspects of aquaculture rearing could be a unique and interesting attraction for visitors. The visitors could see and or provide help in feeding the fish and fish could be prepared at the spot for visitors to taste by local chefs. The Adams Aquafarm would therefore need improved facilities to accommodate this (viewing tanks with window panes for example see figure 10), information material, washroom facilities. Another addition would be to have visitors engage in 'fish your own fish' from designated tilapia tanks after which the caught fish are prepared on the spot by the local chefs. This will provide a unique and inexpensive opportunity for visitors to catch their own fish. This would also create enthusiasm among schools and students visiting the farm and engage them more actively which is important in Barbados as only a small percentage of the youth is currently interested in working in the agriculture sector. However, this process needs to be carefully designed and monitored (e.g. only in one tank) as pathogens could be accidentally (but easily) introduced by visitors (Bondad-Reantaso and Arthur, 2008)

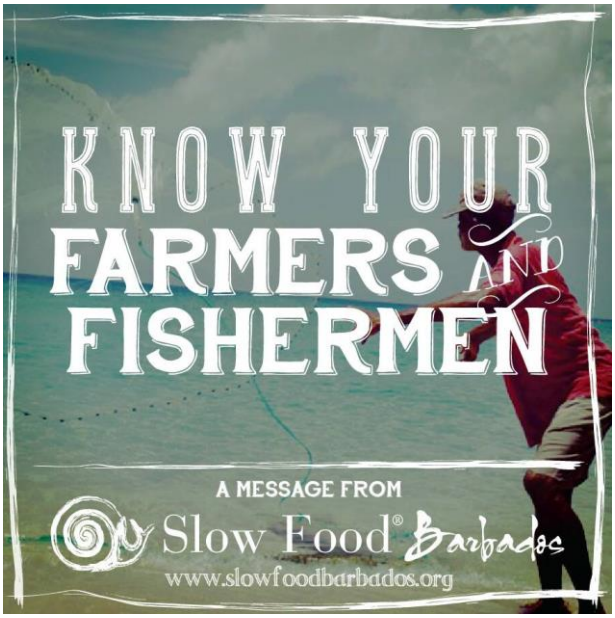


Figure 10a: Fish tank with window pane;
Source: http://forevervictorygardens.com/category/the-secret-garden/
10b: a recent message by Slowfood Barbados.
Source: www.slowfoodbarbados.org

In general the aquaculture sector is constrained by lack of proper policy and legal frameworks that give certainty to investors in the sector, expensive feeds, difficulty in obtaining loans, limited hatchery capacity, insufficient trained people, lack of extension services and lack of a value chain approach. There is thus a need for a more holistic approach to develop the aquaculture sector in Barbados. The Ministry of Agriculture has expressed an interest to develop an aquaponics demonstration centre. A few small aquaponics farms exist in Barbados but not yet at a commercial level. Aquaponics, a form of sustainable aquaculture combining aquaculture and hydroponics is still in its infancy yet could provide great development potential. Aquaponics is capable of producing fish, fruits and vegetables in a recirculation system that conserves freshwater resources. This demonstration centre would provide training for small-scale

aquaponics farmers, educate secondary and tertiary school students and could provide tours for educational purposes for tourists and locals.

2.1.5 Traceability and value adding

For the tourism sector safe food consumption is essential. Strict fish safety handling procedures according the regional and international guidelines should therefore be mandatory for all levels throughout the fish chain to prevent contamination and illnesses. A holiday is easily ruined as a result of food poisoning and seafood is more susceptible and a high risk product. Traceability of fish products in Barbados throughout the fish chain enhances the trust of consumers (both direct consumers as well as hotels and restaurant).

There are various fish fleets in Barbados: longliners and the offshore fleet which target flyingfish *(Hirundichthys affinis*) and large pelagics such as dolphinfish (*Coryphaena hippurus*), tunas (Scombridae), kingfish (*Scomberomorus cavalla* and *Acanthocybium solandri*), and swordfish (*Xiphias gladius*). The inshore fishery is also important with sea eggs and reef fishes (e.g. hinds (Serranidae); Parrotfishes (Scaridae); grunts (Haemulidae); surgeonfishes (Acanthuridae); Triggerfishes (Balistidae)) as well as lobster (*Panulirus argus*), conch (*Strombus gigas*) and sea eggs (*Tripneustes ventricosus*). The coastal pelagic fishery is also important for catching jacks (Carangidae); herrings (Clupeidae); silversides (Atherinidae); anchovies (Engraulidae); ballyhoo (Hemiramphus spp.) and small tunas (McConney, 2011). Artisanal catches were found to be the most dominant with 63% of the catch, with subsistence and industrial fisheries contributing 20% and 17% of the catch, respectively (Mohammed et al. 2015). A processing industry has emerged to clean, cut and package these products for local and export markets (Mahon et al. 2007). Once fish are landed by fishers a variety of people are involved in preparing the fish for sale (e.g. boner, butchers, meat saw operator, packer (plant), scaler and skinner) after which direct sellers will further distribute the fish (e.g. hawkers, sales person, vendors, transshippers, wholesaler/exporter). The fish are in principle sold to four categories: 1) directly to consumers; 2) processors; 3) vendors; and 4) to the *Fish Fry*. Processors and vendors will consequently sell the fish onwards to the export market; restaurants and supermarkets. The percentage of the fish that is sold to the various categories depends on the type of fish. Flying fish is sold for approximately 45% to processors, 25% to vendors, 21% directly to consumers and 9% to the fish fry. Tuna, on the other hand, is sold for 70% to processors, 17% to vendors, 7% directly to consumers and 6% is sold to the *Fish Fry* (Mahon et al. 2007).

The fish are thus handled in various ways by the variety of market outlets impacting the type and intensity of food safety and quality of fish handling. It is important to address shortcomings between small-scale fishers and the hospitality trade and improve quality and reliability throughout the supply chain. To service the tourist market local producers need to find profitable and competitive ways to meet tourism industry demands for volume, quality, regularity traceability, and safety requirements

International regulations on seafood quality and handling have become more important in Barbados since 1997 with the requirement that all facilities that handle fish for export be inspected and passed by registered inspectors. The Barbados' Strategic Plan 2005-2025 refers to safeguarding Food and Nutrition Security by rationalizing and regulating the fishing fleet and market infrastructure to ensure Sanitary and Phyto-Sanitary (SPS) compliance and adherence to Hazard Analysis Critical Control Point (HACCP) principles as well as to enhance the agricultural health and food safety program.

As a result of a request by the Barbados Government to export fish and fishery products to the European Union (EU), the Food and Veterinary Office of the European Commission conducted a mission to Barbados in 2009. Their aim was to evaluate whether the system in place in Barbados for fishery products was equivalent to those required by the EU and would thus allow

fish and fishery products to be exported to the EU. The report (FAO, 2012) concluded that the system in place did not guarantee that fish and fishery products are produced with a standard that is equivalent to those required by the EU. Underlying reasons listed were the lack of the requisite legislation, the need for the implementation and maintenance of HACCP based programs from fishing vessels, through landing sites, to markets and processing establishments, the requirement for the establishment of monitoring programs for chemical and microbiological contaminants, the provision of adequate laboratory facilities and an adequate enforcement system including the need for training of all staff performing official controls.
These failures in quality and food safety of fish handling at various critical points in the fish chain affects the fish consumed by both tourists and locals in Barbados. The type of improper fish handling, as depicted with the high quality tuna in Figure 11, can cause food poisoning and creates a high risk to consumers and shows a poor level of fish handling and processing. Improving the standards of level of fish handling and processing in all parts of the fish chain is therefore critical in further developing the fishery and improving the linkages between fish producers and processors with buyers in the tourist-related markets. Improper handling creates an apprehension among processors and hotels and restaurants to source local seafood products. Processors indicate that hotels and restaurants often prefer imported fish products as they perceive this to have followed a higher standard of fish handling and processing. Improving the quality in fish handling and processing could provide higher benefits for fishers and processing workers.

Figure 11: High quality tuna (grade 1) destined for a well-known sushi restaurant which tourist frequent handled improperly on metal trollies which could cause cross-contamination at one of the popular fish markets
Source: author

Common problems of sourcing fish and fishery products locally are well-known- inadequate quality, reliability, or volume of produce, exacerbated by poor transport and lack of communication and information between supplier and buyer (Karunasagar, Ryder and Roessink, 2012). Since the mission by the EU and publication of the report by the FAO in 2012 the fishing sector in Barbados has made several improvements both at the small-scale as well as national level to improve quality and food safety of fisheries. However, as the pictures in Figure 10 indicate improvements need to be made and there is a need to improve the traceability system of fish products and improve the fish handling procedures. Currently there is a regional project being implemented in Barbados (and other Caribbean countries), titled “Support to the Caribbean Forum of ACP States in the implementation of commitments undertaken under the

Economic Partnership Agreement (EPA): Sanitary and Phytosanitary measures".[5] The project is implemented by Inter-American Institute for in Agriculture (IICA), and the Caribbean Regional Fisheries Mechanism (CRFM) is responsible for the fisheries component of the project. This project aims, *inter alia*, to improve the quality of fish products in Barbados. The project is divided into three sub-components: the establishment of a sound and comprehensive national and regional legislative framework; the development and organization of the national and regional institutional frameworks and coordinating mechanisms; and capacity building, and in particular, the capacity needs of environmental monitoring programs for achieving good SPS standards for the fisheries and aquaculture situation in CARIFORUM States.

Barbados has also developed a Sanitization Standard Operating Procedures (SSOP) and Standard Operating Procedures (SOP) Manual for the sixteen landing sites. A laboratory is currently in place that helps carry out tests for testing and improving food safety. Various types of training are currently being carried out by Barbados National Union of Fisherfolk Organisations (BARNUFO) and one of them covers "Implementing Standard Operating Procedures and Fish Handling (SOPs)" (see Figure 12). This course teaches the importance of SOPs in fish handling. It takes a practical approach and demonstrates the correct way to clean and manage the working environment. This was only for one group of fisherfolk, however, and there is a lot of scope for more training of operators throughout the whole food value chain from vessels to processing and distribution, in good manufacturing and hygiene practices and in undertaking and implementing HACCP systems to meet the requirements of international standards and regulations.

As a result of the recent training of fish vendors they have received "Fish Vendor Checklists" for daily checks on various aspects for the processing area, the chemicals used, clothing, etc. This type of training and use of daily checklists (which is helped by various chosen councils and 'leaders' in the fish market in Bridgetown) is crucial in internalizing improved handling and quality assurance procedures. However, so far only a small number of fishers and fish handlers have received training.

Figure 12: SOP training of BARNUFO
Source: BARNUFO

In order to improve quality and food safety it is also important to improve the traceability of fish throughout the fish chain. Traceability refers to the ability to trace the history (e.g. date, landing by fisher, name vendors) of fish products. In the case of the fisheries sector, supply relates to

[5] This project is funded under the 10th European Development Fund (EDF) programme. The project is implemented by IICA, and the Caribbean Regional Fisheries Mechanism (CRFM) is responsible for the fisheries component of the project.

supplier traceability and *process traceability*. Supplier, referencing to fisher and vendors (as well the skinner/scaler etc.), which ensures that the source of all raw materials/ ingredients can be identified from the records and documentation and *process traceability*, which ensures the ability to identify all ingredients and process records by vendors (chemicals used at the market place) as well as at the professional processors level. At the processors level traceability appears to be of high standard and records kept are very detailed.
At the local level (at fish markets) further improvements need to be made. Recently, however, a few vendors have been designing their own type of traceability system based on a personal label or a rather rudimentary system of colored stickers which enables the vendor to systematize and eventually trace back the fish if necessary. The sticker cites the date and the color will implicate from which boat the fish came from and who cleaned the fish (vendors make use of different fish cleaners). The entrepreneur is the head of BARNUFO, Vernell Nicholls and she is now training other fish vendors to carry out a similar type of labeling making use other types of stickers (stars etc.) to mark the variance between the different vendors. One individual, a boat owner, has designed his own personal labels for each type of fish he catches (tuna, dolphin, marlin and swordfish). He is the only person with personalized labels (outside of the processing plants) and is also the only fisher selling at the Barbados Agricultural Development and Marketing Corporation Southern Farmers' Market. This market currently runs on the last Friday and Saturday of each month. Primarily, it is to give local farmers and other types of entrepreneurs the opportunity to market their diverse range of products or services. It shows the fish vendors have embraced the increasing need for traceability of the product; however, it is a rudimentary system that needs further expansion. Further training and fine-tuning of the traceability system is therefore necessary. The photos below exemplify the change in work clothing/protective gear worn at the Fish Market in Bridgetown as well as the introduction of the fish vendors to the traceability system with stickers (see Figure 13 and 14).

Figure 13: Vernell Nicholls of BARNUFO explaining vendors on the new labelling system
Source: Author

Figure 14: In the upper row the bags are labelled with colored stickers by fish vendor Vernell Nicolls, the bottom is packaged by boat-owner Henderson Inness (picture right).
Source: Iris Monnereau

Fish processing in Barbados has made significant progress over the years. A large percentage of the processing is primary, with the fish being cleaned, filleted and packaged. One processor, Morgan Fisheries, has engaged in value adding of fish products with considerable success as the company has gone a step further to produce secondary products such as fish burgers and fingers, breaded and smoked fish and they have just introduced a fish breakfast sausage and thus engage in value adding in the fishery (see Figure 15). To produce the Fish Wieners for example they use both local fish as well as imported white fish. These products are destined for the local supermarkets although some are also sold to hotels. This type of value adding is certainly an area which needs encouragement as well as less burdensome incentive arrangements if it is to develop further.
Another processing plant is carrying out research and development in terms of turning fish waste into liquid fertilizer which will be sold to farmers in the nearby area. Fish fertilizer is a very good product for promoting plant growth. It's high in nitrogen which can be used for growing plants and can be produced naturally.

Figure 15: Morgan Fisheries and some of their value-added products

Critical issues in traceability and value-adding to be improved are (including some recommendations made in Moore et al. 2014) support to implementation of the SOP Manual in the sixteen landing sites and increased training of fisherfolk (incl. fishers, vendors, cleaners etc.) in all aspects of quality and food safety (fisherfolk should follow mandatory training linked to

their fisheries permit). Improving the legislative framework build around the concept of SPS. Legislation on quality and food safety is fragmented and outdated and requires a revision and updating. It's important to implement legislation that meets international standards. Even though Barbados might not be targeting certain export markets, the legislation should still be in place;
Cruise ship markets and the impact of food safety measures needs to be further analyzed to improve linkages between local producers and cruise ships. It should be kept in mind that lead buyers in the cruise industry are unable and unwilling to co-operate with large numbers of fluctuating fish suppliers, and thus require a single interface to facilitate engagement with and mobilization of small-scale fishers. It is crucial to pay attention to the quality and safety of fish being supplied to tourists in Barbados since consumption by tourists is counted as income generating activity in the export market.

2.1.6 Sargassum products

Massive quantities of pelagic sargassum occurred throughout the Caribbean in 2011, impacting aquatic resources, fisheries, shorelines, waterways, and tourism. Similar events have occurred since then, with a particularly heavy influx of sargassum observed during 2015 (Doyle and Franks, 2015). Pelagic sargassum is a brown alga, or seaweed that floats free in the ocean and never attaches to the ocean floor. There are two species of sargassum involved in the sargassum influx: Sargassum natans and Sargassum fluitans (Doyle and Franks, 2015).
Sargassum beds are an important nursery habitat that provides shelter and food for endangered species such as sea turtles and for commercially important species of fish such as tunas. It can therefore act as a Fishing Aggregation Device and attract fish. At the same time it causes damages to the fisheries sector as fishers are not able to go out; interferes with their motors; renders landing sites useless and can change the composition of species in the catches.
The influx of sargassum also severely affected the tourism industry in Barbados. Authorities have released emergency funding to clean up piles of decaying seaweed so huge and pungent that tourists have cancelled summer beach holidays. The large mats of plant matter attract biting sand fleas and smell like rotten eggs. One large beach resort in Barbados went as far as investing USD$ 100,000 in a ploy to keep sargassum off their beach. They designed and constructed a boom that floats in the water of approximately 335 meters long to prevent sargassum from reaching the shore.
The underlying causes for the increased presence of sargassum are still unclear. The seaweed boom that started in 2011 could be the result of warming ocean temperatures and changes in the ocean currents due to climate change. However, others believe it is primarily due to increased land-based nutrients and pollutants washing into the water, including nitrogen-heavy fertilizers and sewage waste that fuel the blooms.
The species of pelagic sargassum involved in the influx also provide some potential however. The sargassum is different from sea moss (used for juice) and sargassum can be used as mulch or compost – allow salt to wash out in the rain and mix with manure and soil. Collected sargassum can also be usefully redistributed in areas affected by beach erosion. In Barbados there have been attempts by the Barbadian company BIOGEN to build a Caribbean Seaweed Industry. Currently Biogen harvests the seaweed to produce a particle board, designed and developed from seaweed wood, which can be use in houses or boats (see Figure 16).

Figure 16: Sargassum board and sargassum soap
Source: Author

BIOGEN also attempts to produce fertilizer out of the seaweed and one of the company's goals is to make use of sargassum for food. The sargassum appears in two forms, the yellow seaweed, which is fresh and consumable and could help fight obesity because it brings down your cholesterol, is rich in fibre, is anti-fungal, and supposed to be anticancerous; and the brown seaweed, which is good for agricultural and landscaping purposes, but should not be consumed. BIOGEN have used the yellow seaweed primarily for salads, soup, as a breakfast item, to add to gravy, fish dishes and such like. The taste is to flavour and the texture is like coconut, some person have made it as shake, with banana and milk. The tourists in Barbados could potentially become a market for these types of products and as a result support livelihoods and benefits to the local population (including fishers) when they collect sargassum.

2.2 Recreational activities

2.2.1 Gamefishing

Visitors enjoy recreational fishing activities such as gamefishing and spearfishing. These types of fishing provide recreation for visitors and locals as well as fish for consumption in Barbados. The recreational fishery has grown because of its association with tourism. There are three types of fishing which is of interest to tourists: game fishing on charter boats; international game fishing competitions and spearfishing.

There a large number of charter boats with a capacity to fish 25-50 km offshore targeting barracudas, tunas, wahoo, dolphinfish and billfish. Catches of these and smaller recreational boats are not recorded. The charter boats make day trips with tourists. The influx of sargassum has been posing problems for the charters, as it was hard for them to get out; they would have to go longer distances and equipment would get tangled up.

Sportfishing for international tournaments in Barbados has a long history, but it was formally established in 1961 and moved the sport to organized competitions (Peirce, 2009). The culmination of all our efforts has been Barbados International Fishing Tournament, which was started in 1990. They have now reached the point where the tournament has been accredited as an International Game Fish Association Offshore Championship qualifying event and which allows Barbados to send teams to the annual world championships in Mexico and Costa Rica. Fishing at the tournament in 2015 was considered by the interviewees to be very good, which was believed to be perhaps due to the influx of sargassum, as for the first time they had 11

yellow-fin tunas (see figure 17). They catch blue marlin, white marlin, sailfish, spearfish and yellowfin tuna. Below 500 lbs the fish are released, above 500 they keep and are recorded.

Figure 17: Four tuna caught in 2015 at the international tournament
Source: Irelan Herrera

Figure 18: Swordfish caught at the 2015 tournament
Source: Irelan Herrera

The most popular gamefishing tournament in the region is in Grenada where the fishing is considered extremely good attracting a large number of foreign boats. A challenge for the Barbados gamefishing tournament is the distance to the other eastern Caribbean islands, the lack of fish abundance and the lack of financial means for global and regional advertisement. Improved outreach and better advertisement would ensure more private boats would come to Barbados for the tournament as currently only approximately five 'foreign' boats currently come for the tournament. One or two teams fly down for the event and rent charter boats to participate in the tournament, however, the equipment of these charters is not of to the high quality many competitors are accustomed to and can thus not be a source of growth.

2.2.2 Turtle tours and swimming with turtles

The Barbados Sea Turtle Project (BSTP) is based in Barbados at the University of the West Indies. The BSTP has been involved in conservation of the endangered marine turtle species that forage around and nest on Barbados for the past 25 years through research, education and public outreach as well as monitoring of nesting females, juveniles and hatchlings. Turtle nesting occurs on most of the beaches around the island, many of which are heavily developed with tourism infrastructure providing both challenges and opportunities for sea turtle conservation. Sea turtles are important for the biodiversity of Barbados but also have become an integral part of the attraction of a holiday in Barbados. During a one-hour diver a SCUBA diver can be assured to see at least one hawksbill turtle, and a visitor on a catamaran cruise will likely see several green turtles at the several 'swim with the turtles' sites. If a visitor comes during the nesting season he or she has a high likelihood of seeing at least one nesting hawksbill turtle during a 2-week stay at any of the hotels on the south coast. The BSTP have produced guidelines and developed printed materials to inform visitors on how to minimize any potential negative impacts of their visits on the turtles at the "Swim with the Turtles" sites. In 2007, the BSTP's approach to inclusion of visitors in sustainable sea turtle activities resulted in it being listed in Islands magazine's Blue List as one of the top 100 sustainable tourism activities on islands anywhere in the world.[6]

2.2.3 Recreational diving

Coral reef ecosystems are vital to the economies of Caribbean countries. Reefs are also an important economic resource as well as homes for commercially and recreationally important species of fish and a recreational locale for diving and tourism activities and healthy reefs are thus crucial. For food, for natural coastal protection and as a basis for tourism, people in the Caribbean are dependent on the services that reefs provide. Storms and hurricanes can damage and remove corals from a reef through direct wave action, or cause indirect damage through abrasion, blocking light and smothering by depositing sediment and rubble. According to the World Resource Institute the Eastern Caribbean's coral reefs are at extremely high risk from overfishing and pollution. Overfishing caused steep reductions in the populations of herbivores, especially large parrotfishes, which are the most effective grazers on Caribbean reefs. Diving tourism is paramount in Barbados and healthy reefs and an abundance of marine species is crucial for both the fisheries sector as well as recreational activities catering tourists.

Figure 19: Reef restoration in Bonaire
Source: Raymon van Anrooy

[6] Information taken from the website of the BTSP http://www.barbadosseaturtles.org/pages/about_us/index.html

Reef restoration has been considered an option. An example of reef restoration has been carried out in Bonaire (see Figure 19). The Bonaire Coral Restoration Foundation (CRF Bonaire) is a nonprofit conservation organization dedicated to restore the shallow water populations of Elkhorn and Staghorn corals along the coast of Bonaire and Klein Bonaire.[7] By setting offshore coral nurseries and transplanting mature Staghorn and Elkhorn coral onto degraded areas, the CRF Project aims to restore a portion of the coastal coral reef of Bonaire. To date, more than 6000 coral fragments are growing in the nurseries in Bonaire and almost 4000 have been already transplanted on the reef by Coral Restoration divers. The restoration creates awareness among the volunteers (e.g. tourists) and educates them on the importance of coral reef health. To become a volunteer and get involved, divers have to complete the training course and become a certified *PADI Coral Restoration Diver*. Volunteer divers assist the CRF Bonaire staff in the coral nurseries, helping with maintenance activities and transplanting corals to the designated restoration sites. This could thus be an attraction for PADI divers to come to Barbados. A reef restoration project will be carried out in Barbados by the Bellair's Research which is funded by the Interamerican Development Bank. Nevertheless, reef restoration projects do not diminish the negative external impacts that already affect coral reef health such as sewage pollution, agricultural run-off, pollution, and coral bleaching as a result of increased sea surface temperatures.

Barbados has a large number of shipwrecks, approximately 200, of which the SS Stavronikita and the wrecks in the Carlisle Bay Marine Park are the most important for SCUBA divers. The SS Stavronikita is the most famous wreck on the island. This purposely-sunk Greek freighter, now part of the Folkestone Underwater Park, hosts a rainbow of huge tube and rope sponges and lies at 36 metres of water.[8] The Carlisle Bay Marine Park, is not an official marine park but is commonly regarded so. This shallow, calm bay is home to a cluster of wrecks including the the Berwyn (a World War I French tug boat that went down in 1919), the Eilon (sunk in 1996), Ce-Trek (a cement boat sunk in 1986), the Bajan Queen (party boat sunk in 2002) and the Cornwallis (a freighter sunk during World War II and relocated to the marine park).[9] These shipwrecks, which act as FADs are thus very important to attract diving tourism and for marine ecosystem health. In order to improve marine health the BMT has been placing reef balls, another form of FADs, in the sea off the South Coast of Barbados in an effort to support coral reef rejuvenation and as well as provide habitats for fishes and other marine animals.
The establishment of a reef balls garden in Oistins Bay is a means of creating artificial habitat for fish, which will help to build back the fish population in the Bay. Reef balls are man-made, individually created, specially created concrete modules designed to restore ailing coral reefs, attract marine life and create new fishing and scuba diving sites. The reef balls can be used in any combination of number and sizes and are environmentally friendly with a lifespan of approximately 500 years. The BMT placed 30 reef balls into the water along the southern coast to create an artificial coral reef to mimic the natural environment, encourage the growth of new corals, and attract fish to the area. While the reef balls are successful in this way, they tend to be fished by fisher folk, thus reducing their impact and they are not frequented by recreational divers. The BMT has now secured funding from the United Nations Development Program to develop an Undersea Heritage Museum with underwater sculptures for the 50th Independence Anniversary of Barbados (November 2016). An underwater sculpture park has already been successfully in Grenada, where local fishermen provide water taxi services out to the sculpture sites to tourists, and also benefit from terrestrial sculpture generated business, and thus have a

[7] http://crfbonaire.org/
[8] https://www.padi.com/scuba-diving/scuba-diving-travel/vacation-spotlights/barbados/
[9] Ibid.

sense of ownership/desire to protect them for personal long term gain. The proposed sculpture park in Barbados is supposed to assist in the regeneration of coral reefs; provide a habitat for fish, and provide alternative livelihood strategies for local fisherfolk; while providing unique tourist snorkeling and scuba diving opportunities. The budget available for the sculptures is, however, very limited (USD$ 40,000) and only a restricted number of sculptures can be designed, build and deployed for this amount. The theme of these sculptures will be 'the era of slavery in Barbados'. I think it could therefore be interesting to find additional funding to increase the number of sculptures while also developing sculptures that address the era between the slavery period and now expressing cultural features of Barbados (e.g. a donkey cart, a parish church, 'out of town' busstops sign, and Poseidon with the trident).

3 Financial mechanisms

There are a wide range of possibilities for financing improved linkages between the tourism and fisheries sector. Developments in this area will most likely largely be based on public-private partnerships but also include civil society groups. Existing partnerships for this development have to overcome challenges of shaping a common vision, synchronization of priorities and expectations, enabling collaboration and coordination mechanisms, and forging better understanding and consensus around emerging challenges and opportunities. Private sector investments – in aquaculture, fisheries and tourism- involving both domestic and foreign capital, are an important source of funding. Donor funding can also provide myriad openings and can offers opportunities for improving the environmental sustainability of marine and coastal management, meeting social and economic development needs of the fisheries sector while also improving the tourism sector. Trade-offs between the different objectives of projects might occur nevertheless. Where external financing is required for public investments, NGOs and large environmental funds (e.g. the GEF, TNC) can support national investments in healthy oceans and ecosystems. The list below provides a selection of sources for donor funding for projects in Barbados linking the fisheries and tourism sectors:

GEF Small Grants: Biodiversity

The GEF Small Grants Programme (GEF SGP) is a Corporate GEF Programme implemented by UNDP to provide financial and technical support to communities and civil society organizations (CSOs) to meet the overall objective of "Global environmental benefits secured through community-based initiatives and actions". Biodiversity is one of the five themes of the GEF Small Grants Programme.

The Barbados Marine Trust has received a small grant from UNDP to support the development of an Undersea Heritage Museum with sculptures. This sculpture park is intended to assist in the regeneration of coral reefs; provide a habitat for various species; protect the shoreline; provide alternative livelihood strategies for local fisher folk; and provide unique tourist snorkeling and scuba diving opportunities.

United Nations Western Central Atlantic Fishery Commission (WECAFC): Aquaculture

The Governments of Antigua and Barbuda, Barbados, Bahamas and St. Kitts and Nevis assign high priority to the development of the aquaculture sector and requested FAO technical assistance to develop their aquaculture sector in early 2015. They stressed that in the development of the sector a value chain approach should be applied, from pond to plate. The project aims to contribute to more efficient and inclusive food and agricultural systems in the selected Caribbean countries, through sustainable development and management of the aquaculture sector and development of selected value chains. The support provided is expected to lead to increased farm production efficiencies, economic benefits, alternative employment

opportunities and incomes in the Eastern Caribbean island states and will contribute to improved food security and food import reduction; all key development objectives of the participating governments. The primary target beneficiaries of the project are the small- to medium-scale enterprises, or farms, involved in aquaculture in the four countries. The project proposal is currently under review and the outcome is still unknown.

Barbados Small Business Association
Previously the Barbados Small Business Association has received financing in the amount equivalent to US $150,000 from the Multilateral Investment Fund, and it intends to apply part of the proceeds to payment for goods, works, related services and consulting services to be procured under the project Development of Tourism Micro-Projects in Barbados. The project will be jointly financed with the Ministry of Tourism of Barbados. The main objectives of this project are: (1) improve the quality of products offered to tourist micro-small and medium-sized businesses in three clusters (Agro-processing, woodworks and small hotels), and (2) improve the packaging, marketing and distribution of indigenous products and services offered to tourists by micro and small businesses in the three selected clusters. Involving the fisheries sector in this type of projects is crucial for example for sargassum products as well as arts.

Inter-American Development Bank: Integrating Small Farmers into the Cruise Ship Value Chain in Barbados
This project addresses the insufficient technical capacities and limited access to markets small-scale farmers in Barbados face as well as the lack of knowledge that anchor (or buyer) companies have in dealing with low income commercial partners. Increasing skills, engaging farmer associations and formalizing linkages within the cruise tourism/grocery sector value chain, will improve farmer competitiveness. This project does not include the fisheries sector but a similar type of project could facilitate the inclusion and participation of a wider number of fishers in higher value markets.

4 Conclusions

This report has shown variety of successful linkages between the fisheries and tourism sector in Barbados. Some of them provide great potential to be of interest to other countries in the region (e.g. Antigua has received financial support to set up *a Fish Fry*). Some of the activities however need additional support. Some potential opportunities to explore are:

1. Oistins attracts numerous visitors to Oistins' *Fish Fry* every week and offers a truly Barbadian cultural dining experience in which fish plays a key role with a street party setting for visitors and locals with karaoke and other festive activities as well as stalls with crafts and arts. The *Fish Fry* is a great success from a business and livelihoods perspective. The majority of fish consumed is imported; however, so further improvement for livelihoods and food security lies in improving the crafts and entertainment. It could also be a possibility to: develop a fishing museum, an upgrade of the library, provide guided tours of the market and surrounding areas; while the Barbados Marine Trust (BMT) proposed sea turtle viewing activity and guided tours of the Oistin's Fish Market area;
2. Development of "Seafood City" by the Bridgetown fish market where many tourists pass by to get to and from the cruise ships. This would involve an improved Bridgetown market with cooked-up fish consumption products, a fishing museum (if not in Oistins) and guided tours of the market with arts and fish soup for sale;
3. Fishermen's week is a week full of activities for fisherfolk and those associated with the industry as well as for outsiders. Some of the main attractions are the fish boning

competition, the climb-the-grease-pole competition as well as the crab racing and boat racing competition. These activities could be broadened to attract and educate tourists. The Tuk band, stilt walking and limbo dancing during the Oistin's Fish Festival, for example, have been identified as needing further cultural development;

4. Various activities have been undertaken to eradicate lionfish presence in Barbados resulting in, *inter alia*, lionfish derbies and cook-ups were undertaken to encourage market and public awareness. Initially this was undertaken by the public sector but for 2015 the Lion Fish Derby has been taken over by the private sector with the brand REEF in collaboration with PADI as the organizers in 2015. There is ned for continued efforts in public awareness building (workshops with local chefs on safe preparation of lion fish as many chefs are still unfamiliar with the myriad ways lionfish could be prepared and encourage more lionfish derby's) as well as training of fisherfolk in fish handling of lionfish as this provides a significant obstacle to fishers;
5. Considering that Barbados imports more fish than it produces and because of its location there is scope for the aquaculture sector in terms of import substitution. Currently there is only one well-functioning aquaculture farm in Barbados. Improving aquaculture production is important;
6. Development of an aquaponics demonstration center providing training for small-scale aquaponics farmers, educate secondary and tertiary school students while also providing tours for educational purposes for tourists and locals providing an unique and interesting attraction for visitors;
7. It is important to address the current mismatch of supply and demand between small-scale fishers and the hospitality trade and improving quality and reliability throughout the supply chain. To service the tourist market local producers need to find profitable and competitive ways to meet tourism industry demands for volume, quality, regularity traceability, and safety requirements;
8. Traceability and appropriate quality and food safety handling of fish is crucial for the fisheries sector. Some fish vendors have been entrepreneurs, embracing traceability schemes of fish products by their own simple system. Although in recent years improvements have been made, more remains to be done in order to export to certain international markets as well as to ensure safe fish consumption in Barbados. Amongst others there needs to be an increase in training of fisherfolk (incl. fishers, vendors, cleaners etc.) in all aspects of quality and food safety; supporting for a simple yet effective traceability system for fish vendors; a legislative framework build around the concept of SPS. This would build enhance the relationships between the fisheries sector and hotels and restaurants;
9. Cruise ship markets and the impact of food safety measures needs to be further analyzed to improve linkages between local producers and cruise ships. It should be kept in mind that lead buyers in the cruise industry are unable and unwilling to co-operate with large numbers of fluctuating fish suppliers, and thus require a single interface to facilitate engagement with and mobilization of small-scale fishers. In addition, quality and food safety needs to be of a very high standard for the cruise ships to consider buying local processed fish;
10. Carry out a feasibility study on creation of an eco-label and specific regulations for Barbados fish products (branding and adding value for greening fisheries);
11. Decreasing IUU fishing in Barbados will ultimately result in a more sustainable fishery, higher benefits for fisherfolk as it contributes to higher rewards throughout the fish chain and increased income for the government as a result of taxes;

12. The influx of sargassum in recent years has affected the fishing sector greatly. There could be potential in designing sargassum food or beauty products for the hospitality industry;
13. Visitors enjoy recreational activities such as gamefishing, spearfishing, swimming with the turtles during catamaran cruises and diving among the shipwrecks. The international game fishing tournament has been a success but needs wider advertisement and public outreach to increase foreign boats participating in the game fishing tournament;
14. The anticipated Underwater Heritage Sculpture Park proposed by the BMT could provide incentives for local fishers as well as the tourism sector. The budget available for the sculptures is, however, very limited (USD$ 40,000) and only a restricted number of sculptures can be designed, build and deployed for this amount. The theme of these sculptures will be 'the era of slavery in Barbados'. I think it could therefore be interesting to find additional funding to increase the number of sculptures while also developing sculptures that address the era between the slavery period and now expressing cultural features of Barbados (e.g. a donkey cart, a parish church, 'out of town' busstop sign, and Poseidon with the trident) with which recreational divers can pose for pictures.

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