

**Fishing Exports and Economic Development of Least Developed
Countries:
Bangladesh, Cambodia, Comoros, Sierra Leone and Uganda**

Paper Prepared for UNCTAD

Stephen Golub

Abir Varma

Swarthmore College

February 2014

The authors would like to thank Mussie Delelegnarega, Graeme Macfadyen and Gert Van Santen for helpful information and discussion. All remaining errors are own responsibility.

Contents

| | |
|--|-----------|
| 1. Introduction..... | 1 |
| 2. Trends in Fish Production & Exports..... | 3 |
| 3. Demand-Side Constraints | 11 |
| 4. Supply-Side Constraints..... | 21 |
| Selected LDCs: Experiences and Potential..... | 25 |
| 5. Bangladesh | 25 |
| 6. Cambodia | 35 |
| 7. Uganda..... | 49 |
| 8. Comoros..... | 41 |
| 9. Sierra Leone | 47 |
| 10. Conclusion | 58 |

Tables

| | |
|--|-----------|
| 1. World Export Volume 1980 - 2010 (million tons) | 6 |
| 2. Share of Exports (Volume) by Income Group in World Total (Percent) | 6 |
| 3. Share of Exports (Value) by Income Group in World Total (Percent) | 6 |
| 4. The Top Ten Fish Exporters | 7 |
| 5. The Top Ten Fish Importers | 7 |
| 6. World Import Volume 1980-2010 (million tons) | 8 |
| 7. Share of Imports (Volume) by Income Group in World Total (Percent) | 8 |
| 8. Share of Imports (Value) by Income Group in World Total (Percent) | 8 |
| 9. Bilateral Trade by Income Group 1990-2010 (USD Millions) | 8 |
| 10. Selected EU, USA and Japan Fish Import Guidelines | 16 |
| 11. Domestic Credit to Private Sector (Percent of GDP) | 24 |
| 12. Bangladesh - Breakdown of Production by Sector (2010) | 26 |
| 13. Bangladesh - Fish Export Flows to Major Partners (USD Millions & Proportion of Total) | 27 |
| 14. Cambodia - Official Fish Export Flows by Destination 2000-2012 (USD) | 37 |
| 15. Uganda - Estimated Annual Catch, Lake Victoria 2005-2011 (Tons) | 50 |

Figures

| | |
|--|-----------|
| 1. Bangladesh - Value of Fish Exports (USD Millions) | 26 |
| 2. Bangladesh - Volume of Fish Exports (Tons) | 26 |
| 3. Bangladesh - Fish Exports to the EU 1990-2007 (USD Millions) | 30 |
| 4. Bangladesh - Fish Exports to USA 1990-2007 (USD Millions) | 30 |
| 5. Bangladesh - Typical Fishery Product Distribution Chain | 33 |

| | |
|--|-----------|
| 6. Cambodia - Total Official Fish Exports by Value 2000-2012 (USD Millions) | 37 |
| 7. Uganda - Volume of Exports 1991-2010 (Tons) | 50 |
| 8. Uganda - Value of Exports 1991-2010 (USD Millions) | 50 |
| 9. Uganda - Exports to EU 1994-2012 (USD Millions) | 51 |
| 10. Uganda - Exports to USA 1994-2012 (USD Millions) | 51 |
| 11. Uganda - Typical Fishery Product Distribution Chain | 54 |

Boxes

| | |
|--|-----------|
| 1. Hazard Analysis Critical Control Point | 13 |
|--|-----------|

List of Acronyms

ACP – African, Caribbean, and Pacific Group of States
AEC – ASEAN Economic Community
AGOA – African Growth and Opportunity Act
ASEAN – Association of Southeast Asian Nations
BFRI – Bangladesh Fisheries Resource Institute
BMU – Beach Management Unit
CA – Competent Authority
CAC – Codex Alimentarius Commission
CPUE – Catch per Unit Effort
DFR – Department of Fisheries (Uganda)
DWFN – Distant Water Fishing Nations
EAC – East African Community
EBA – Everything But Arms
EC – European Commission
EEZ – Exclusive Economic Zone
EPA – Economic Partnership Agreement
EU – European Union
FAO – Food and Agricultural Organization
FDA – US Food and Drug Administration
FDI – Foreign Direct Investment
FPA – Fishing Partnership Agreement
FiA – Cambodian Fisheries Administration
GDP – Gross Domestic Product
HACCP – Hazard Analysis Critical Control Point
IOTC – Indian Ocean Tuna Commission
IUU – Illegal, Unreported and Unregulated (Fishing)
JKIA – Jomo Kenyatta International Airport (Nairobi)
KAMFIMEX – Kampuchea Fish Import and Export Company
LDC – Least Developed Country
MOC – Ministry of Commerce (Cambodia)
MSC – Marine Stewardship Council
NGO – Non-Governmental Organization
SPS – Sanitary and Phytosanitary Measures
SSA – Sub-Saharan Africa
TBT – Technical Barrier to Trade
UNBS – Uganda National Bureau of Standards
UNCTAD – United Nations Conference on Trade and Development
UNEP – United Nations Environment Programme
USD – United States Dollars
WTO – World Trade Organization

1. Introduction

The last 50 years have witnessed a virtuous cycle of rapid growth of export-led labor-intensive exports, expanding employment, rising wages and living standards in a number of emerging countries, as labor has been absorbed into modern industry out of subsistence agriculture and urban informal activities. Export-led growth is often identified with manufacturing, based on East Asia's, and to a lesser extent, Latin America's successes but it is often difficult for least developed countries (LDCs) to compete in manufacturing, given the head start and advantages of China and other emerging economies (Collier 2008). UNCTAD has been a leader in pointing out that agriculture and fishing are viable alternatives to manufacturing for export-led growth (UNCTAD 2008).

Agriculture and fishing share many of the features of manufacturing, both in terms of their potential to spur growth and employment, and the institutional constraints they face in achieving this potential (UNCTAD 2008, Brenton et al. 2009, Golub and McManus 2009). Several critical aspects of manufacturing exports promoting development and poverty reduction apply to agriculture and fishing: 1) high labor-intensity, 2) possibilities for technological upgrading and consequently raising producer incomes, 3) access to state-of-the-art foreign technology through foreign direct investment (FDI) and technical assistance, and 4) the necessity of attaining international competitiveness. For agriculture and fishing, especially, sanitary and phytosanitary norms in developed country markets are a major hurdle for successful exporting (Golub and McManus 2009, FAO 2011) analogous to the demanding quality specifications of global buyers of manufactured products.

In this paper, the focus is on fishing. Fishing has great potential for a number of LDCs, both coastal and inland. Fish has become the world's most highly traded food commodity, demand for fish is continuing to grow strongly, and some developing countries have a comparative advantage due to a combination of low-cost labor and waters rich in highly-prized varieties of fish.

A distinctive feature of agriculture and fishing involves natural resource management. This is particularly crucial for fishing, given that a lack of property rights creates a tendency towards overexploitation—the tragedy of the commons. Indeed, overfishing is a grave threat to the

global fishery industry. Preventing overfishing by limiting access to the resource is difficult under any circumstances but poses particular challenges to LDCs with limited administrative capacities and funds for monitoring and preventing overfishing. Thus LDCs face a difficult dual challenge in boosting productivity and competitiveness on the one hand and preserving fish stocks on the other. Besides diversifying exports, creating employment, and increasing foreign exchange earnings, fishing is a major source of protein in many LDCs and is important for improving food security.

A further characteristic of LDC fishing industries is the coexistence of industrial and artisanal fishing. LDCs, particularly in Africa, feature large informal sectors accounting for about half of GDP and 80-90 percent of employment (Fox et al 2013, Benjamin and Mbaye 2012). In the case of fishing, the distinction between formal and informal operations takes the form of artisanal and industrial fishing. As for the informal sector more generally, artisanal fishing is a survivalist activity. Artisanal fishing is a major source of employment and earnings, but is handicapped by rudimentary infrastructure and poor hygiene. Foreign vessels using advanced technologies to catch high-value demersal species dominate industrial fishing. Industrial fishing operations provide revenues to LDC governments through fishing agreements, but often land little of their catch in the LDCs and sometimes contribute to depletion of stocks. The importance of artisanal fishing further complicates policy towards the fishing sector, as there may be tradeoffs between employment and resource management. The paper approaches these issues through case studies of five LDCs: Bangladesh, Cambodia, Comoros, Sierra Leone, and Uganda.

The paper begins with an overview of the global fishing industry to put the actual and potential participation by LDCs in context (section 2). Section 3 assesses the constraints LDCs face on the demand side, in terms of meeting quality and hygiene standards in developed country markets. Section 4 turns to supply side constraints impeding LDC fish exports, including lack of information, infrastructure and access to credit. Sections 5-9 contain the case studies. Section 10 provides conclusions and recommendations.

2. Trends in Fish Production, Employment & Exports¹

Global Production and Employment: A Summary

In 2011 the total world production of fish was 154 million tons, with 131 million tons intended for human or animal consumption. The global fish food supply has steadily grown at an average annual rate of 3.2 percent for the last five decades but capture production has plateaued at around 90 million tons since the mid-1990s. The growth in fish production has been sustained by the rapid expansion of aquaculture: over the last three decades global aquaculture production has tripled, growing at an average annual rate of 8.8 percent. Aquaculture now constitutes 40 percent of world fish production compared to 21 percent in 1995.

The growing importance of aquaculture is also reflected in employment trends – employment in fish farming has increased 5.5 percent annually over 2008-2012 in contrast to a 0.8 percent in capture fisheries (both marine and inland) for the same period. Still, aquaculture only accounts for about 30 percent of total fishing employment and 40 percent of production. Capture fisheries are on average more labor-intensive than aquaculture mainly due to low-productivity ‘artisanal’ or small-scale fisheries.

Fish production supports employment across a variety of sectors. Harvesting, processing, packaging, and distribution activities constitute the supply chain for delivery of the commodities while the production of equipment and technology for vessels, handling, processing and shipping constitute support services. The primary sector alone generated employment for 54 million people in 2011, and when all related services and dependents of the employed are taken into account fisheries support the livelihoods of about 10 – 12 percent of the world’s population. Large-scale industrial fishing and small-scale artisanal fishing both contribute importantly to GDP but in very different ways. Small-scale fisheries are far more labor-intensive and employ the vast majority of people engaged in fishing-related activities in developing countries. World Bank (2010) estimates that as of the mid-2000s, small-scale fisheries employed about 79 million people, of which 23 million are engaged in fishing and 56 million in post-harvest employment, whereas large-scale fishing employed a total of only 5 million, of which 1.5 are fishers and 3.5

¹ Unless otherwise stated, all data in this section is attributable to FAO’s *Fishery Statistical Collections* internet database and FAO (2012a) and FAO (2012b).

million are engaged in post-harvest activities.

Exports: A Focus on Developing Countries

Fish is one of the largest commodities in world trade by value and accounts for approximately 10 percent of total world agricultural exports. Exports as a proportion of production rose from 25 percent in 1976 to 38 percent in 2010. Tables 1-9 show global trends in fish trade. Table 1 presents the evolution of the volume of world trade and average annual growth over 1980-2010. The 57.2 million tons exported in 2010 was almost triple the volume in 1980. The sharp increase in trade in seafood reflects several factors: increased consumption demand, especially in developed countries, depletion of stocks in fishing waters of developed countries, and technical advances in preservation, processing and transport. Indeed, the diffusion of storage and packaging technology together with improved processing methods has been crucial drivers of the globalization of fish distribution. Processed fish make up 90 percent of total world trade due to the highly perishable nature of fish commodities. Frozen fish accounted for 39 percent of exports in 2010 compared with 25 percent in 1980. The proportion of prepared and preserved fish as a share of total fish trade expanded from 9 percent to 16 percent during the same period. In addition to large stocks of fish, developing country comparative advantage in fishing derives from the high labor-intensity of fishing and fish processing. Advances in transport and storage technology also enable global fragmentation of the fishing value chain, as in manufacturing (Golub, Jones and Kierzkowski 2007): the countries in which fish are caught or produced, processed and ultimately consumed can all differ. Table 1 shows that exports from developing countries have increased much more rapidly than from developed countries, and LDC exports have grown even faster, although from a low base. Tables 2 and 3 show the shares of these groups of countries in world exports by volume and value. The share of fish exports from non-LDC developing countries rose from 41.8 percent in 1980 to 58.1 percent in 2010. While the share of fish exports from LDCs more than doubled from 1.1 percent in 1980 to 2.4 percent in 2010, it is still totals only 1.4 million tons (FAO 2012a), equivalent to 16 percent of the quantity exported by the non-LDC developing countries back in 1980. With the exception of aquaculture-grown shrimp, catfish and canned tuna, consumers in the EU and the US still tend to prefer North Atlantic and North Pacific species found closer to home (FAO 2011). These

species are caught by domestic fishers and often exported to processing hubs like China from where the fish is re-exported back to retailers. An additional consideration is that much of LDC fish exports take the form of unrecorded cross-border trade with neighbors, particularly in Africa, e.g., around the Lake Victoria. Thus the share of LDCs in global exports is likely higher than shown in Tables 1-3.

Tables 4 and 5 show the largest exporting and importing countries by value, indicating that fish exports are increasingly concentrated in a few relatively labor-abundant developing economies that supply the developed world. China contributed about 12 percent of total fish exports in 2010; reprocessing imported fish and exporting it to developed economies has driven its recent emergence as the biggest fish-exporting nation. Thailand and Vietnam - the third and fourth biggest exporters by value - have also established major fish processing industries that have fuelled their contribution to trade. The formation of major reprocessing centers in the above countries has meant that re-exports of fish have been a major driver of the trade in fishery products: increasing volumes of fresh or minimally processed catch are now imported into China, for instance, and subsequently reprocessed and exported to the major consumer markets. While developed nations still account for the majority of fish imports - around 75 percent of all imports by value (see Table 8) - Tables 6 and 7 show that imports of developing countries have grown rapidly: the share of global fish imports by volume of developing countries (non-LDCs) increased from 24.8 percent in 1980 to 41 percent in 2010. Moreover, Table 9 shows that bilateral trade between developing (non-LDCs) and developed countries, and developing countries and LDCs, has grown more rapidly compared to that between LDCs and developed countries.

The EU, US and Japan are the three biggest import markets for fish and their dependence on imports from developing countries will only increase in the future. The EU - the largest market for fish imports - currently accounts for slightly more than a quarter of world imports. The EU, the US and Japan are highly reliant on external suppliers with imports accounting for approximately 64, 60 and 54 percent, respectively, of domestic fish consumption (AICP-CEP, 2013).

With a common regulatory system for imported fish products in the 28 member nations, the EU is the largest single market for imported fish products; excluding intraregional trade, the EU

accounted for 26 percent of total world fishery imports in 2010 (FAO 2012b). The EU is a particularly important market for Sub-Saharan Africa (SSA), which is home to 34 of the 49 LDCs, due to both proximity and historical ties. The volume of fish exported from SSA is very small but 70 percent of these exports are destined for the EU (Josupeit 2011). In Africa a large amount of regional cross-border trade in fish is unrecorded, particularly in the Great Lakes region. Since the EU has the most stringent quality and sanitary regime, as discussed below, many small-scale producers and processors are shut out, but there is great potential for increasing exports of fishery products. EU import demand is set to rise as local supply is squeezed by the need to rebuild depleted fish stocks and demand is projected to continue to rise.

Table 1: World Export Volume 1980-2010 (million tons)

| | 1980 | 1990 | 2000 | 2010 | Avg. Annual Growth Rate (1980-2010) (Percent) |
|-------------------------------|------|------|------|------|---|
| Exports (Total) | 21.1 | 32.6 | 48.8 | 57.2 | 3.2 |
| From All Developed Countries | 12.1 | 15.3 | 20.5 | 22.6 | 2 |
| From All Developing Countries | 9 | 17.3 | 28.2 | 34.6 | 4.4 |
| <i>From LDCs</i> | 0.2 | 0.4 | 0.7 | 1.4 | 6.5 |

Table 2: Share of Exports (Volume) by Income Group in World Total (Percent)

| | 1980 | 1990 | 2000 | 2010 |
|-----------------------|------|------|------|------|
| Developed Countries | 57.1 | 47 | 42.1 | 39.5 |
| Developing Countries: | | | | |
| LDCs | 1.1 | 1.1 | 1.5 | 2.4 |
| Others | 41.8 | 51.9 | 56.4 | 58.1 |
| Total | 100 | 100 | 100 | 100 |

Table 3: Share of Exports (Value) by Income Group in World Total (Percent)

| | 1980 | 1990 | 2000 | 2010 |
|-----------------------|------|------|------|------|
| Developed Countries | 59.9 | 56.7 | 48.9 | 49.5 |
| Developing Countries: | | | | |
| LDCs | 1.8 | 2.1 | 2.4 | 2.1 |
| Others | 38.2 | 41.2 | 48.8 | 48.4 |
| Total | 100 | 100 | 100 | 100 |

Table 4: The Top Ten Fish Exporters

| Exporters | 2000 (USD million) | 2010 (USD million) | Avg. Annual Growth Rate (1980-2010) (Percent) |
|---------------|--------------------------|--------------------------|---|
| China | 3 603 | 13 268 | 13.9 |
| Norway | 3 533 | 8 817 | 9.6 |
| Thailand | 4 367 | 7 128 | 5 |
| Viet Nam | 1 418 | 5 109 | 13.2 |
| United States | 3 055 | 4 661 | 4.3 |
| Denmark | 2 756 | 4 147 | 4.2 |
| Canada | 2 818 | 3 843 | 3.1 |
| Netherlands | 1 344 | 3 558 | 10.2 |
| Spain | 1 597 | 3 396 | 7.8 |
| Chile | 1 794 | 3 394 | 6.6 |

Table 5: The Top Ten Fish Importers

| Importers | 2000 (USD million) | 2010 (USD million) | Avg. Annual Growth Rate (1980-2010) (Percent) |
|-------------------|--------------------------|--------------------------|---|
| United States | 10 451 | 15 496 | 4 |
| Japan | 15 513 | 14 973 | -0.4 |
| Spain | 3 352 | 6 637 | 7.1 |
| China | 1 796 | 6 162 | 13.1 |
| France | 2 984 | 5 983 | 7.2 |
| Italy | 2 535 | 5 449 | 8 |
| Germany | 2 262 | 5 037 | 8.3 |
| United Kingdom | 2 184 | 3 702 | 5.4 |
| Sweden | 709 | 3 316 | 16.7 |
| Republic of Korea | 1 385 | 3 193 | 8.7 |

Table 6: World Import Volume 1980-2010 (million tons)

| | 1980 | 1990 | 2000 | 2010 | Avg. Annual Growth Rate (1980-2010) (Percent) |
|-----------------------------|------|------|------|------|---|
| Imports (Total) | 19.7 | 33.5 | 48.8 | 59.2 | 5.7 |
| To All Developed Countries | 14.6 | 23.8 | 30.5 | 34.2 | 4.3 |
| To All Developing Countries | 5.1 | 9.7 | 18.4 | 25 | 8.3 |
| <i>From LDCs</i> | 0.2 | 0.3 | 0.3 | 0.7 | 6.4 |

Table 7: Share of Imports (Volume) by Income Group in World Total (Percent)

| | 1980 | 1990 | 2000 | 2010 |
|-----------------------|------|------|------|------|
| Developed Countries | 74.1 | 71.0 | 62.4 | 57.8 |
| Developing Countries: | | | | |
| LDCs | 1.1 | 1.0 | 0.6 | 1.2 |
| Others | 24.8 | 28.0 | 37.0 | 41.0 |

Table 8: Share of Imports (Value) by Income Group in World Total (Percent)

| | 1980 | 1990 | 2000 | 2010 |
|-----------------------|------|------|------|------|
| Developed Countries | 84.6 | 86.9 | 83.1 | 75.8 |
| Developing Countries: | | | | |
| LDCs | 0.8 | 0.6 | 0.2 | 0.5 |
| Others | 14.6 | 12.6 | 16.7 | 23.7 |

Sources for Tables 1-8:FAO (2012a, 2012b, 2010) and authors' calculations.

Table 9: Bilateral Trade by Income Group 1990-2010 (USD Millions)

| | 1990 | 1995 | 2000 | 2005 | 2010 |
|-------------------------------------|------|-------|-------|-------|-------|
| LDCs to Other Developing Countries* | 5 | 29 | 86 | 182 | 290 |
| LDCs to Developed Countries** | 194 | 443 | 712 | 966 | 701 |
| Developed to LDCs | 70 | 55 | 34 | 68 | 135 |
| Developed to Other Developing | 648 | 1489 | 1814 | 4589 | 7641 |
| Other Developing to LDCs | 6 | 42 | 90 | 187 | 427 |
| Other Developing to Developed | 4686 | 12956 | 16179 | 22440 | 32130 |

* Developing Countries: Definition as provided by the World Bank Databank Database

** Developed Countries: OECD members

Source for Table 9: UN COMTRADE Database

Major Traded Commodities

Higher priced fish like shrimp, prawns, salmon and tuna are the most frequently traded products by value and exports of these species are mostly directed towards markets in the developed world. Aquaculture has facilitated the production and trade of these high value species, allowing producers to diversify their product range and sell in developed markets. Indeed, species like shrimp, prawns, salmon, tilapia and catfish – among the most farmed fish products - are those that have demonstrated the highest export growth rates in the last decade. One reason the LDCs have generally not been able to participate in the trade of these high-value species is that their proportion of world aquaculture production is only 4.1 percent by quantity and 3.6 percent by value. Low-value species like anchovies are also exported in very large quantities but the value of trade in anchovies and other pelagics is much smaller than the high-value species mentioned above.

LDCs tend to supply unprocessed or minimally-processed fish. Southern European countries buy mostly whole fish while northern European consumers, particularly in Germany and the United Kingdom, buy more processed fish products such as frozen or breaded fillets. Consequently most LDC exports are to Southern Europe.

The most important fishing product from SSA by far is canned tuna. African countries are exempt from the normal 24 percent tariff on imported tuna, providing a significant competitive advantage over non-LDC exporters. Tuna fishing and canning has shifted from the East to the West Coast of Africa, with Mauritius replacing Senegal as the largest African exporter. Frozen fish fillets, mainly of South African and Namibian hake but also including Nile perch from the lakes of Kenya, Tanzania and Uganda, are the second largest fish product from Africa (Josupeit 2011).

Importance to LDC GDP, Employment and Poverty Reduction

Fishing plays a crucial role in a number of developing countries, both for non-LDCs and LDCs, including the five countries studied here. The World Bank (2010) reports the share of capture fishing in GDP at: 4 percent in Bangladesh, 10 percent in Cambodia, 15 percent in Comoros, 9 percent Sierra Leone, and 3 percent in Uganda. Including post-harvest activities raises the share

to 16 percent in Cambodia and 12 percent in Uganda (data unavailable for the other three countries).

In addition to job creation, agriculture and fishing contribute to food security, both directly and indirectly. In a number of LDCs fish provide more than half of the animal protein consumed, including Bangladesh, Cambodia, Gambia, Guinea, Ghana, Indonesia, Sierra Leone, Togo, among others (Béné 2006). Of course, the incomes earned from selling fish are also important.

People engaged in artisanal fishing and fish processing tend to have low-incomes (Béné 2006, Béné et al 2010) and fishing contributes to poverty alleviation through several mechanisms. Artisanal fishing, like the informal economy more generally, provides employment of last resort. In fact, the common-pool resource aspect and low capital-intensity of fishing enable easy entry by low-skilled people with few other options. Béné et al (2010) distinguish a “labor-buffer effect” of absorbing chronic surplus labor and a “safety-net effect” of fishing on short-term shocks. Nevertheless, artisanal fishers are highly vulnerable due to 1) high exposure to risks 2) high sensitivity to those risks and 3) low capacity to adapt to risks. The risks include: physical risks (drowning, accidents); weather-related risks (tropical storms, tsunamis, floods), possibly exacerbated by climate change; and resource risks, as fish stocks can migrate or be subject to overfishing or disease.

Béné et al (2010) contrast “wealth-based” and “welfare” models of poverty alleviation for fisheries. The wealth-based model focuses on increased investment, value added and exports, whereas the welfare model focuses on the safety-net and labor-buffer effects on sustaining incomes of the poor. According to Béné et al (2010) the wealth-based model focuses too much on resource conservation and income growth at the expense of employment. This argument seems exaggerated, however. To the extent that fish exports contribute to higher earnings, they boost income and lower poverty so there is no contradiction between improved productivity and maintaining employment. Limiting over-exploitation of fish resources is essential for maintaining fishing as an income-generating activity. Modernizing fishing and fish processing does not necessarily imply a decline in demand for labor as fishing and fish processing are likely to remain labor-intensive. Moreover, the “scale effect” of expanded fishing activities on employment could dominate the “technique effect” of reduced labor-intensity. There is no evidence that creation of processing factories, for example, reduce employment of artisanal

fishers. On the contrary, local processing increases demand for fish, as discussed in the Uganda case study below.

Role of women. Fishing is often thought-of as a male-dominated profession but this refers only to the actual capture of fish. In the case of freshwater fishing, women sometimes have their own boats, e.g., in Benin and Cambodia. In Bangladesh, fishing has traditionally been reserved for low-caste Hindu males. This is gradually changing and a World Bank case study found that women of all religions and castes now engage in shrimp fishing in coastal areas. Even if they rarely engage in catching fish, women contribute in other important ways. As noted above, the majority of jobs in fisheries are in post-harvest distribution and processing, and women tend to dominate these activities, particularly when they are artisanal. Overall World Bank (2010) estimated that 47 percent of the people involved in fisheries worldwide are women with wide variations across countries, e.g., 73 percent in Nigeria, 72 percent in India, 57 percent in Cambodia, 32 percent in Senegal, 19 percent in China, and 5 percent in Bangladesh. Women also frequently provide funds to invest in the family fisheries business. Despite women's substantial and increasing involvement in fisheries in some countries, gender inequities arise from traditional beliefs and customs and present-day legal and regulatory barriers.

3. Demand-Side Constraints

Complying with Mandatory Quality and Safety Standards in Major Importing Countries

LDC fishing products face little or no tariff barriers in developed country markets due to low or zero tariffs on unprocessed fish and preferential market access for processed fish products. The biggest non-tariff trade barrier for producers and processors from LDCs is the stringent quality and safety standards system imposed on fish products in major overseas markets, instituted in the 1990s and 2000s. Despite efforts by the WTO to facilitate the standardization of the various national requirements, exporters still face a complex regulatory landscape that is compounded by many differences between the major national regulatory regimes.

The WTO agreements on Sanitary and Phytosanitary standards (SPS) and Technical Barriers to Trade (TBTs) together establish the right of each member country to implement food quality and safety norms to protect the welfare of consumers and animals/plants pertaining to the trade

of a particular product. While these agreements support the harmonization of standards on the guidelines of the Codex Alimentarius Commission (CAC), they also allow countries to adopt enhanced measures if they deem further protection necessary or if there is a “scientific” basis for doing so (FAO 2011). The three biggest importers - the EU, US and Japan – have adopted varying standards in response to rising consumer concerns about quality and safety of seafood. These strict quality and sanitary requirements are major hurdles for developing country exporters, especially LDCs whose fisheries are primarily artisanal.

The shift from final product sampling for safety and quality inspection towards Hazard Analysis Critical Control Point (HACCP) methods in the last two decades has made compliance with import regulations even more challenging for LDCs (FAO 2005). HACCP is based on prevention rather than testing (see Box 1). While the CAC’s adoption of the HACCP is supposed to spread the responsibility for compliance throughout the value chain, the system has put significant pressure on small-scale producers who must follow the required procedures and, in some cases, certify the quality and safety of their harvest. Indeed, the HACCP-preventive system includes requirements for everything from the design of vessels used for capture to the personal hygiene and training of personnel in landing areas. The rising importance of private standards, discussed below, is an additional obstacle for LDC exporters.

Box 1

Hazard Analysis Critical Control Point (HACCP)

HACCP began in the early 1960s as a result of a joint private-public venture to provide safe food for US astronauts on space missions. Developed country governments starting in the 1980s adopted HACCP principles. The Codex Alimentarius Commission (CAC) has developed HACCP codes for food production, including a specific code for fisheries and aquaculture (FAO 2011a).

The objective is lowering of risks rather than inspection and testing. Testing can fail to uncover contamination of some food products even if large samples are used due to the enormous variety of products and unknown probability distribution of contamination (FAO 2011a). Under these circumstances, prevention of hazards is more effective.

HAACP involves seven steps (Sperber and Stier 2010):

1. Hazard analysis, i.e., identification of the main risks of contamination in the production and distribution process;
2. Critical control points, i.e., areas where preventative steps can be applied;
3. Critical limits at each critical control point, i.e., the value of indicators that trigger corrective actions;
4. Critical control point monitoring requirements, i.e., the mandated procedures and their frequency for monitoring indicators at the control points;
5. Corrective actions, i.e., measures to be taken in the event that the critical limits are exceeded;
6. Procedures for ensuring that HACCP is working correctly; i.e., regular inspections and gathering of evidence on functioning of the above steps;
7. Record keeping: HAACP requires records documenting the implementation of the above steps.

The perishability of fish products and the high risks of contamination mean that detailed HACCP measures can be judged necessary and applied at all stages of the production process, including fishing boats, landing sites, storage areas, processing factories and transport facilities.

EU Regulations

Along with the largest market for imported fish, the EU has by far the most stringent regulations. Imports into the EU are largely set at the Commission level but individual countries may also impose their own regulations or establish bilateral agreements. The main legislation is EC Directive 91/493 of 1991, which requires member countries and importers to have in place Good Hygiene Practices and HACCP systems. EU Regulation 466/2001 sets maximum limits for heavy metals on several important species of fish. EU Regulation 2065/2001 imposes labeling requirements for wild-caught fish and aquaculture. Numerous other regulations spell out in substantial detail various required hygiene practices for food products in general, including fish (Ponte 2007, Appendix).

Since 1998 The European Commission (EC) has established a list of countries eligible to export to the EU and can suspend countries from the list if they are deemed not to be adhering to EU regulations. The LDCs that are eligible to export to the European Union are: Bangladesh, Benin, The Gambia, Guinea, Guinea-Bissau, Madagascar, Mauritania, Mozambique, Senegal, Uganda, Tanzania, and Yemen². Togo is eligible only for lobsters and Myanmar is eligible only for wild caught frozen fishery products. Many other LDCs are land-locked without extensive inland waters, but a significant number of coastal LDCs do not have permission to export to the EU. Fish from some of the excluded countries still finds its way to the EU through Fishing Partnership Agreements (FPAs) that allow foreign ships to fish in national waters.

The most distinctive feature of EU regulatory structure is EC certification of a Competent Authority (CA) in the exporting country. That is, to export fish to the EU, the exporting country must have an agency, the CA, that enforces EU-like regulations. This CA has to harmonize national regulatory laws with those of the EU and ensure that operators at all parts of the value chain - from capture fishers/exporting farms to processors and distributors - are producing fish under a system similar to that of the EU. Even if a firm's processing operations meet international standards, the firm cannot export fish products to the EU unless the country has an EU-accredited CA. Prior to establishing a CA, countries must have legislation that requires safety and hygiene that is at the same level as the EU's own legislation (Doherty 2010). In

²Commission decision of 14 December 2009 Amending Annexes I and II to Decision 2006/766/EC. Available at <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:328:0070:0075:EN:PDF>

addition, imports are permitted only from factories or storage facilities which have been inspected and validated by the CA to be at the EU level. Additional requirements apply to aquaculture, limiting levels of heavy metals, pesticides, pollutants, and drugs.

The EU requires a HACCP approach to implementing its regulations, of which traceability is a crucial component. Traceability is the ability to identify the path of a suspect fishing product throughout the value chain, so that the source of any problems can be quickly located and remedied. When problems are identified, the CA must promptly intervene to suspend operations of the producers responsible for the problems.

Recent EU laws relating to illegal, unreported and unregulated (IUU) fishing that prevent fish products obtained in uncertified fishing vessels from entering the international market provide additional regulatory burdens (Josupeit 2011). On November 26, 2013 the EC proposed a ban on fish from Belize, Cambodia and Guinea, and warned several other countries, for failing to prevent IUU fishing.³

United States Regulations

The United States food regulatory system is more fragmented than the EU's, with numerous different federal and state government agencies involved (FAO 2012b). The United States instituted an HACCP system in 1997. Fish is subject to the Food and Drug Administration (FDA) mandatory inspection program. The National Oceanic and Atmospheric Administration (NOAA) of the US Department of Commerce provides optional seafood quality and safety inspections for a fee.

Japanese Regulations

Health scandals in Japan in the early 2000s led to rising public concerns. The Japanese government responded with the amendment of the Food Sanitation Law and the enactment of the Food Safety Basic Law. The Food Safety Basic Law mandates a risk assessment approach, as in Europe and the United States. The Food Safety Commission, composed of scientific

³“European Commission intensifies the fight against illegal fishing”. European Commission - IP/13/1162 26/11/2013 http://europa.eu/rapid/press-release_IP-13-1162_en.htm.

experts, oversees testing of food testing. The revised Food Sanitation Law bans imported foods containing potentially dangerous residues.

A comparison of the three biggest importing markets is presented in Table 10 to provide a snapshot of the kind of quality and safety norms that governments and private sector participants in LDCs have to establish if they hope to sell their fish products to consumers in these countries, illustrating the relative stringency of the EU requirements. Thus, if LDC exporters can successfully overcome the regulatory hurdles to market access in the EU, they will generally also be able to meet the sanitary requirements of other major importers.

Table 10: Selected EU, USA, and Japan Fish Import Guidelines

| Exporter (s) | Importing Country/Region | | |
|--|--|---|---|
| | European Union (EU) | United States (US) | Japan |
| Can an exporter export to the importing country/region without a CA in their own country | No | Yes | Yes |
| Role of exporters | Apply HACCP to be certified by their own country's CA after physical inspections, documentation and final product checks | Apply HACCP and present necessary documentation to FDA through importer | Have a HACCP-based program |
| Role of importers | Receive cleared import | Check HACCP plans of exporters and present them to FDA inspectors Notify authority of all imports (under Bioterrorism Act) | Notify authority of all imports |
| Role of exporting government | EU certifies a CA in exporting country | Can voluntarily create an agreement with the US | Can voluntarily create an agreement with Japan |
| Role of importing government | a) Mandatory inspection system to ensure EU requirements are met b) Border inspection posts | a) Inspection system to ensure US requirements are met (not mandatory) b) Border inspection posts | a) Mandatory inspection system to ensure Japanese requirements are met* b) Border inspection posts |

Source: FAO (2005).

Proliferation of Private Standards

The rise of global retailers and supermarket chains, with clienteles that demand high quality as well as environmentally sustainable produce, has driven the demand for increasingly stringent private safety and quality standards as well as ecolabels (certification related to the

sustainability of fish stocks). Private standards certifying use of sustainable fishing methods apply to marine and inland wild fish while safety and quality primarily are directed to aquaculture. Rather than risk bad publicity, loss of consumer confidence and falling sales in the event of a food scare, large international companies have often adopted private certification systems to monitor the safety and quality standards of the fish marketed in their stores (FAO 2011a). Even though private quality and safety systems are based on HACCP protocols just like mandatory public regimes, private standards tend to be more stringent due to the priority on safeguarding firms' reputations. Private certification for suppliers to large retailers is often compulsory. In addition, upscale chains seek to position themselves as socially responsible through promotion of sustainable fishing. They often rely on non-governmental organization, notably the Marine Stewardship Council (MSC). MSC has the most extensive private system of certification of fisheries, and provides two types of standards: "sustainable fishing" and "seafood traceability". Many large retailers refer to MSC certification in their publicity and documentation. Numerous other organizations are also active in eco-labeling.

The recent emergence of private standards and certification has added to the regulatory burden faced by processors who seek to export fish products to developed markets. The dominant market presence of large food firms in the EU and the US means that fish exporters are obligated to comply with these standards to sell fish products to a sizeable share of consumers in the two biggest importing regions. Private standards cover approximately 70 percent of all retail trade in fishery products and that supermarket chains are responsible for more than 80 percent of fish sales in some European countries (FAO 2011a).

Retailers often develop relationships with large suppliers since the latter operate on a scale that guarantees a steady supply of fish. Supermarkets prefer to buy products with specified sizes and varieties but fish from artisanal and other small-scale fishers cannot be so standardized. Thus adhering to these private standards remains more relevant for suppliers in professional aquaculture - where it is easier to produce to specification - and industrial fisheries (Josupeit 2011).

Effects of Standards on LDC fish exporters

For LDC exporters of fish, public regulations are at present a more pressing issue than private standards. Few if any LDCs can meet the stringent private standards and their exports are destined for other developing countries or auction houses and wholesalers in developed countries, where prices are lower but standards are less stringent. In addition, LDCs primarily export minimally processed fish products while private standards are mainly applied for processed products such as frozen and ready-to-eat items imported by retailers for their own labels and other brands (FAO 2011a).

EU standards are of particular importance to LDC fish exporters due to the dominant role of the EU as a market for LDC fish products and the higher stringency of EU regulations. These standards pose daunting challenges to both public and private sectors in LDCs (Doherty 2010) requiring large set-up and continuing costs.

Public-Sector challenges. There are very large set-up costs in establishing a CA that will satisfy the EU. Food-safety systems in LDCs are generally adapted to an environment with much lower levels of public resources devoted to health and safety and lower expectations about protection from food hazards. The authorities in LDCs are therefore not likely to be knowledgeable about HACCP systems, laws are likely to be outdated if they exist at all, and government officials have weak abilities to implement them. Public infrastructure and services are also likely to be below EU standards: laboratories with outdated equipment and poorly-trained staff, landing sites with poor hygiene, inadequate cold storage facilities, and weak monitoring and reporting of breakdowns. Landing sites, for example, must have sanitary facilities both for the people handling the fish and for the fish itself, access to clean water, freezers, and roads that permit access to trucks.

Private-Sector Challenges. Substantial investments by processors are often required to meet HACCP requirements. The case studies below discuss the significant efforts undertaken by Bangladesh and Uganda to lift EU import bans. Not least is the cost of hiring foreign consultants to advise on the upgrading. Small producers are particularly impacted by requirements of traceability. Cold storage is also a problem for private firms, including cold rooms, freezers, and ice machines. Okello (2011) details some of the steps non-LDC Kenya had to take at landing sites to obtain EU certification: potable water, washable tables, cold storage facilities,

toilets and a perimeter fence. The storage areas were required to have a tin roof, walls, and a cement floor. By European standards, these stipulations are minimal, but they may be prohibitive for small operators.

While these standards are costly for developing countries and thus can constitute “barriers” to exporting, they can also serve as “catalysts”, promoting upgrading of fishing infrastructure and technology (Anders and Caswell 2009). Many of the requisites of certification are also the supply-side constraints on boosting productivity and efficiency. As the case studies of Bangladesh and Uganda below illustrate, the urgency to overcome EU bans galvanized public and private stakeholders in the fishing industry to work together and make progress on longstanding impediments. The benefits of certification include greater security of access to existing markets, access to new markets, diversification into higher value-added products, lower losses due to spoilage, and price premiums for higher quality.

Moreover, certification by public and private agencies can provide an opportunity for dialogue and assistance from foreign governments and NGOs in improving the fishing value chain. For example, in 2007/2008 the MSC pre-assessment of Lake Victoria Nile perch fishing in Kenya, Tanzania, and Uganda played an important part in the development of the 2009-2014 Lake Victoria fisheries Management Plan. Relatedly, the NGO Naturland together with the German Agency for Technical Cooperation (GTZ), a Dutch importer, a Tanzanian processing firm, and 350 small scale fishers collaborated on a project “Ecolabeling of Nile Perch from Bukoba” in Tanzania” (FAO 2011a).

Efforts at both national and international levels are required for LDCs to upgrade their fishing industries. At the local level, the supply-side constraints associated with poor administration and lack of infrastructure have to be addressed. At the international level, harmonization of the multiplicity of public and private standards is of particular importance to LDCs, given their limited capacities. In addition, the WTO could explore modifications to the TBT and SPS agreements, constraining developed country governments from adopting standards that are unsupported by scientific evidence and formulating guidelines for the implementation and duration of suspensions of market access that balance the legitimate concerns about health in developed countries with the onerous effects of lengthy bans and costly procedures on LDC exporters (Doherty 2010).

Quantifying the Effects of Developed Country Standards on LDC Exporters

A few studies have examined the quantitative effect of developed country standards on LDCs. Nimenya, Ndimira and de Frahan (2012) compute the tariff-equivalent “price wedge” of quality standards for East African (Kenya, Tanzania, Uganda) frozen fish fillet exports. They find that quality standards impose barriers that are often very high, equivalent to tariffs of 100 percent or more, with the tariff-equivalent particularly high at the time of the EU import bans in the late 1990s and still well above 50 percent in the mid-2000s. Anders and Caswell (2009) use a gravity model approach to estimate losses of fish exports following the introduction of HACCP in the United States. Their main finding is that HACCP is associated with a significant decline in fish exports, holding other gravity equation determinants steady. Moreover, the negative effect on fish exports is concentrated on smaller and poorer exporters, i.e., LDCs, while developed country exporters gained. These studies are consistent with the hypothesis that quality standards are harmful to LDC fish exporters.

Erosion of Tariff Preferences and International Competition from Non-LDCs

The flourishing fish exports of non-LDC developing countries provide the biggest competitors to fish exporters in LDCs. Governments in developing countries like China, Thailand and Vietnam that have nurtured high quality processing facilities and good public and private management practices have helped their nations become some of the top exporters in the world. As developed country consumers purchase more fish from retail markets - mostly processed or frozen food items - developing countries that have a combination of relatively abundant low-cost labor, established value-added processing facilities and strong quality and safety controls most likely will deepen their dominance in the international trade in fishery products (FAO 2011a). In addition, since retailers prefer streamlined supply chains and have started buying their fish products directly from aquaculture producers there will be additional business directed towards countries where quality and safety controls are already in place. For example, the French company Carrefour - currently the world’s second biggest retailer - now sources its shrimp directly from fish farmers in Thailand (FAO 2011a).

LDCs benefit from preferential access to developed country markets, with exemptions from tariffs on processed fish products. The EU has traditionally allowed duty free access to African Caribbean and Pacific (ACP) countries, mainly former colonies, and African LDCs can export duty-free to the United States under AGOA. The EU has replaced the unilateral Cotonou Agreement provision with Economic Partnership Agreements (EPAs). Multilateral or bilateral negotiations lowering import duties on non-LDC developing countries erode the value of these preferences and thus tend to be opposed by LDCs (Doherty 2010).

On the other hand, several factors are propitious to further growth of LDC fish exports. Some of the major developing country exporters are encountering limits to growth as they have fully or excessively exploited nearby stocks of fish. Overfishing in the Yangtze River in China has led to such a drastic decline in fish stocks that it has sparked discussion over whether a 10-year ban on fishing in the river should be implemented (Straits Times 2013). In addition, if LDCs can attract foreign investment in aquaculture, enabling retailers to monitor both the harvesting and processing of fish, LDCs could become more competitive with other developing countries. Moreover, LDCs that have an established artisanal fishing sector, such as Bangladesh and Senegal, may be able to leverage their fishing tradition in the near future as developing countries like China that both harvest and process fish may increasingly specialize in processing in order to stabilize fish stocks.

4. Supply-Side Constraints

Stringent safety and quality norms block access to major importing markets for many LDC fish exporters ultimately because of poor processing facilities, procurement methods and lack of testing and certifying products throughout the value chain. These high costs in turn reflect general limitations in the business environment in these countries as well as sector-specific problems.

The combination of deficient infrastructure, poor human capital, limited access to finance, weak administrative capacities and absent safety nets restrict LDCs' capability to develop an industrial standard fisheries sector. These supply-side barriers prevent both coordination between players along the value chain and the development of competent supply chains that can compete with those in top exporting nations.

Moreover, the prevalence of artisanal fisheries in LDCs means operations are difficult to monitor and regulate, and are less likely to adhere to international standards. The substantial share of unregistered fishers in artisanal fisheries also often translates into violations of IUU regulations. The few operations that do register with the authorities are often unable to attain a scale at which they can adopt internationally accepted best practices at acceptable costs, due to the large fixed costs involved. The problems are pervasive, including unhygienic practices, lack of ancillary support services, high input costs, and lack of physical infrastructure. Even in Indonesia - a non-LDC developing country - for instance, artisanal fishers report the need for improved packaging and lower fuel and finance costs in order to learn and adapt new skills and technology. Indonesian firms also report poor quality logistics infrastructure as an important cost driver (Lord et al. 2010). All of these problems are generally even more acute in LDCs.

Deficient Transportation and Storage

Inefficient transportation is a major constraint to fishery exports. Distance, of course, is the biggest determinant of transportation costs so efficient and cheap transport is crucial for exporters. The dearth of paved roads in LDCs - on aggregate, 20.8 percent of roads are paved in LDCs as compared to 46.9 percent in all developing countries - contributes to inconsistent delivery schedules and substantial fuel costs even for transporting fish over small distances (World Bank 2013). The lack of investment and maintenance of roads is compounded by excessive red tape at customs and border checkpoints, resulting in costs and delays for fish exporters in LDCs (Biggs 2012). Exporters in SSA are especially disadvantaged because their internal transport costs - getting exports from production and processing areas to ports of departure - are often greater than the costs of transporting goods between countries.

Equally important, the lack of access to cold storage facilities at landing areas in LDCs severely limits the ability of artisanal fishers to participate in distribution chains that supply to developed countries. The lack of refrigeration means that LDCs cannot participate in the rising share of frozen and processed fish exports in world trade. Traditional processing and preservation techniques employed by artisanal fishers in the absence of refrigeration - like the smoking of fish using kilns, firewood, charcoal and gas amongst SSA fishing communities - can increase

the concentration of harmful chemicals above limits specified by international regulations (Akande et al. 2012).

High Electricity Costs

Intermittent electricity supply and the subsequent costs to operate back-up generators to cover for the power shortages make up a significant share of operating costs for small and medium size firms in LDCs. This restricts the number of fish processing businesses in LDCs to a few large oligopolistic firms in the industrial sector. Moreover, frequent outages add friction to the supply chain - making processing operations less efficient - and the cost of running generators is generally much higher than using electricity from the grid. In SSA, the cost of operating generators can be up to 3-5 times greater than obtaining electricity from national distribution networks (Biggs 2012; Mbekeani 2012). Across all LDCs electric power transmission and distribution losses average 21 percent of electricity generated (World Bank 2013). Transmission and distribution losses in Cambodia - one of the LDCs profiled in this paper - are 28 percent of the total output generated. The corresponding share for most of the top non-LDC exporters is around 6 percent.

Lack of Access to Finance

As mentioned before, processing firms have to operate on a large scale in order to lower costs of compliance with developed-country norms. Access to credit is limited for small and medium fisheries enterprises in LDCs because of underdeveloped financial systems, as illustrated in Table 11, inhibiting investment to expand and upgrade facilities. Financial markets in most LDCs are characterized by high real interest rates and high collateral requirements and banks are reluctant to lend to agro-business ventures (Biggs 2012). Moreover, the financial system is particularly inaccessible to low-income artisanal fishers, who often do not have sufficient registered assets to provide suitable collateral to banks. Working capital is also hard to come by and fishers often have to borrow from their customers at high cost. Fishers operating in the waters of Lake Victoria, for instance, often enter into advance payment arrangements with traders (Masette 2011). The resultant pressure on local fishers to meet contracted fish deliveries and to repay traders results in compromised catch quality. More generally, prepayments create a

“debt and poverty trap” for fishers.

Table 11: Domestic Credit to Private Sector , 2012 (Percent of GDP)

| | | |
|------------------------|---------------|--------|
| The Five Selected LDCs | Bangladesh | 49.6 |
| | Cambodia | 38.7 |
| | Comoros | 20.6 |
| | Sierra Leone | 6.3 |
| | Uganda | 16.3 |
| The Five Top Exporters | China | 133.7 |
| | Norway | NA |
| | Thailand | 147.9 |
| | Vietnam | 111.6* |
| | United States | 193.6 |

*2011.

Source: World Bank (2013b).

Resource Management and Data Collection

Without accurate information on the number of fishers and their income, as well as trends and data on current fish stocks, governments in LDCs find it difficult to evaluate the impact of different production and export upgrading strategies (Josupeit 2011). ‘Wild’ fish are a common resource and sustainable catch levels for the present as well as the future can only be secured if governments regulate the intensity of fishing activities. Thus, the relevant authorities in LDCs should collect data on the stocks of different species in order to monitor the impact of their policies. The Chinese government’s recognition of the importance of statistics on the fisheries and aquaculture sector has been a major factor behind China’s rise as the biggest fish exporter in the world. China now collects monthly, mid-year and annual data for multiple statistical indicators and special institutes are commissioned to use the latest technologies to verify the numbers of different species (FAO 2012b). Indeed, the regulators in China collect data on wholesale market prices and both capture and aquaculture production by species, fishing area, fishing vessels, fishing gear, and farming method amongst other indicators. A similar data collection system would allow LDC governments to evaluate their fisheries resources and target policies accordingly.

Selected LDCs: Experiences and Potential

5. Bangladesh

Overview

The fisheries industry in Bangladesh contributes around 5 percent to GDP and export earnings (Alam and Dey 2011; Hussain 2010). Moreover, fish constitutes a significant part of the national diet, accounting for 60 percent of animal protein consumption (which is 15 percent of total protein intake) (Belton et al. 2011; Hussain 2010; Dey et al. 2010). In addition to being a crucial source of nutrients, fish is also a major part of Bangladeshi culture. Some 15 million people (out of a total population of 155 million) are estimated to be either directly or indirectly employed in the fisheries sector, 73 percent of rural households are involved in aquaculture (Alam and Dey 2011; Belton et al. 2011; World Bank 2013a). With a rich biodiversity in fisheries - Bangladesh is home to about 320 different species of fish - the country has significant potential and comparative advantage in the fisheries industry. The heart of the Ganges Delta lies in Bangladesh and multiple river systems (Ganges-Padma, Brahmaputra-Jamuna and Meghna) provide large and varied fisheries resources. Bangladesh is now both the third largest inland captures producer in the world and the fifth largest aquaculture producer (Hussain 2010). Since independence in 1971 the fisheries industry has seen steady growth with production tripling in the last two decades (Alam and Dey 2011). Between 1984 and 2009 annual average growth in fish production was 5.6 percent, largely driven by the expansion in inland aquaculture fisheries, which grew at a rate of 9.7 percent.

Table 12 displays the diverse nature of Bangladesh's fisheries between inland and maritime fisheries. Inland fisheries, which are mostly artisanal, account for the bulk of the catch. Interestingly, more than half of inland fisheries involve aquaculture rather than capture fishing. Maritime fishing, accounting for less than 20 percent of fishing, is also mostly artisanal. Figures 1 and 2 show the general upward trend of exports in terms of value and volume, respectively.

Table 12: Bangladesh - Breakdown of Production By Sector (2010)

| | Water Area ('000 Hectares) | Catch ('000 Tons) | Share of Total Catch (Percent) | Catch/Area (kg/hectare) |
|--------------------------|----------------------------|-------------------|--------------------------------|-------------------------|
| Inland Fisheries: | 4652.7 | 2381.9 | 82.1 | 512 |
| Capture | 4024.9 | 1029.9 | 35.6 | 256 |
| Aquaculture: | 627.7 | 1352.0 | 46.6 | 2154 |
| Pond/Ditch | 350.1 | 1140.5 | 39.3 | 3253 |
| Shrimp/Prawn Farm | 246.2 | 155.9 | 5.4 | 633 |
| Marine Fisheries: | - | 517.3 | 17.8 | - |
| Industrial (Trawlers) | - | 34.2 | 1.2 | - |
| Artisanal | - | 483.1 | 16.6 | - |
| Total | - | 2899.2 | 100 | |

Source: Bangladesh Bureau of Statistics. 2010. *Statistical Yearbook: Chapter on Livestock, Forestry and Fisheries.*

Figure 1: Bangladesh – Value of Fish Exports (USD Millions)

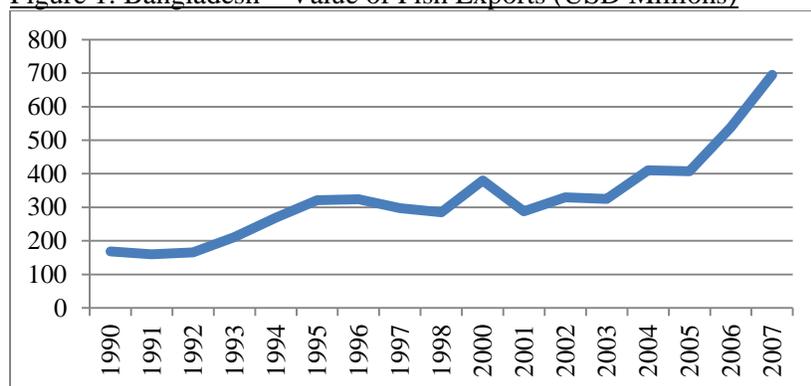
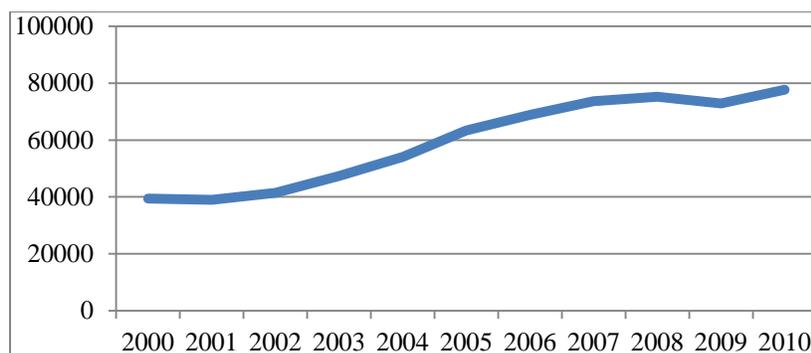


Figure 2: Bangladesh - Volume of Fish Exports 2000-2010 (Tons)



Sources for Figures 1 and 2: Alam and Dey (2011); BBS (2010).

Fish Exports: Focusing on the Prawn/Shrimp Export Industry

Although Bangladesh is the 15th largest capture producer in the world and the 5th largest aquaculture producer, it is only the 39th biggest fish exporter. Exports amounted to a mere 2.7 percent of world fish production in terms of volume in 2010, and while exports have increased in value from around USD 168 million in 1990 to an estimated USD 475 million in 2010, Bangladesh fish exporters have faced many problems meeting international food safety and quality standards (BBS 2010; FAO 2012b; UN COMTRADE). The three major destinations for Bangladeshi fish exports have traditionally been the EU, USA and Japan. As shown in Table 13, even as exports to the EU and the USA have steadily grown (despite periodic bans), exports to Japan declined 4.1 percent on average annually from 1990 to 2007⁴. While it is unclear what has prompted the decline in exports to Japan, the share of fish exports directed towards non-LDC developing countries increased from 2% in 1991 to 10% in 2007. Exports to neighboring India and China together accounted for around a quarter of the total value of exports to this group.

Table 13: Bangladesh - Fish Export Flows to Major Partners (USD Millions & Proportion of Total)

| | 1991 | 1995 | 2000* | 2003 | 2007 | Avg. Annual Growth Rate (1990-2007) (Percent) |
|-----------------------|---------------|----------------|----------------|----------------|----------------|---|
| EU | 76.6 (48%) | 121.5 (38%) | 166.6 (44%) | 210.6 (65%) | 352.4 (51%) | 11.4% |
| USA | 42.5 (27%) | 94.5 (29%) | 138.5 (36%) | 81 (25%) | 217.1 (31%) | 7.9% |
| Japan | 26.6 (17%) | 59.8 (19%) | 28.8 (8%) | 14.5 (4%) | 18 (3%) | -4.1% |
| Developing (non-LDCs) | 2.6 (2%) | 12.7 (4%) | 26.6 (7%) | 6.7 (2%) | 66.6 (10%) | 20.1% |

*There are no data for Bangladeshi fish exports in 1999 in the UN Comtrade Database. Other sources place the total value of exports in 1999 as lower than in 1997 and 2000 as the industry recovered from a major EU ban on Bangladeshi fish exports (Bangladesh Export Promotion Bureau; Yunus 2009).

Source: UN COMTRADE Database and authors' calculations.

⁴ 2007 is the most recent year for which fish export data is categorized by destination.

Bangladeshi fish exports are largely composed of frozen shrimp and prawns, together accounting for 66.5 percent of annual fish exports in terms of volume and 84.6 percent in value in 2010 (BBS 2010). Thus, the shrimp industry in effect drives Bangladeshi fish exports. As in other LDCs, exporters of shrimp have suffered intermittent import bans in developed countries. First, in the late 1970s, when the seafood processing industry had started expanding, the US Food and Drug Administration (FDA) banned seafood imports from Bangladesh because of fears surrounding their quality and safety. In response, in the early 1980s the FAO helped the government develop standards, regulations and inspection schemes for upgrading the quality of exports (Cato et al. 2003). Together with the establishment of two key laws - *The Protection and Conservation of Fish Ordinance, 1982* and *The Marine Fisheries Rules, 1983* - regulating the capture and conservation of fish, the government created a *Fish and Fish Product Ordinance (Inspection and Quality Control)* in 1985. In 1996, the FAO initiated a project to prepare shrimp and fish processing plants in Bangladesh for safety and quality controls based on the HACCP approach that was being adopted by the major importers. The FAO provided assistance to both public and private sector stakeholders - training processing plants personnel and informing the government about new requirements in importing countries. Simultaneously, the FAO and INFOFISH carried out a parallel project that involved industry training as well as promotion of export opportunities to add value to the fish produced in the country - at the time, the value per kilogram of Bangladesh's frozen shrimp was lower than the average of other Asian producers as the country had a reputation for poor quality.

Despite the efforts by the FAO and the government to upgrade the fish industry, on July 30, 1997, the EU banned seafood imports from Bangladesh when their inspections revealed deficient infrastructure, poor hygiene practices along the value chain and a lack of oversight by the government. Fortunately, the ban sparked the industry into action. Shrimp processors invested USD 17.6 million to upgrade plant infrastructure, train employees and audit sanitary facilities (Cato et al. 2003). The government, together with external donors, also invested around USD 450,000 in laboratory upgrades and employee training in order to meet the requirements of the HACCP procedures. The government also amended the 1983 *Fish and Fish Product Ordinance* in order to reflect the provisions of SPS and HACCP methods (Dey et al. 2010). The EU ban was finally lifted in 1998 as some processing plants again obtained licenses to export to the EU after the upgrading projects began to bear fruit.

Bangladesh is now one of the few LDCs approved to export fish products to the EU. Nevertheless, Bangladesh still intermittently struggles to cope with the regulatory obstacles in foreign markets due to poor management by local stakeholders (Dey et al. 2010). The 1997 EU ban resulted in lost seafood export sales of USD 15 million and a 2002 ban by the US FDA cost Bangladesh around USD 30 million. More recently in 2008 and 2009, the EU rejected a large number of shrimp and prawn exports after the detection of excessive “nitrofurans” contamination in some consignments. Shrimp exports only resumed in June 2010 after a self-imposed eight-month ban by the Bangladeshi government, during which the government established some additional laboratory facilities to detect these chemical compounds (Belton et al. 2011). Still, the periodic bans by the EC and the FDA have only been temporary setbacks to the growth in export flows to the EU and the USA. Figures 3 and 4 below show that exports to both markets have steadily grown over the last two decades.

Another problem now is a glut of processing factories - there are currently 129 plants that cater to both domestic and international markets and 53 have approval to export to the EU. Even though domestic and foreign demand far outstrip supply, these industrial processing plants only operate at 20-25 percent of full capacity due to falling harvests of shrimp caused by overfishing (Dey et al. 2010). Indeed since export processors focus mainly on frozen shrimp, they have been constrained by the recent decline in shrimp catch over the last five years, spelling the need for increased diversification and reliance on aquaculture supply sources.⁵ Declining capture stocks have also dampened supply of other species, increasing concerns about the sustainability of fish supplies in Bangladesh.

⁵ Shrimp exports reached a peak of 53361 tons in 2006 but the most recent figures in 2010 showed shrimp exports totaling 51599 tons (BBS 2010).

Figure 3: Bangladesh - Fish Exports to the EU 1990-2007 (USD Millions)

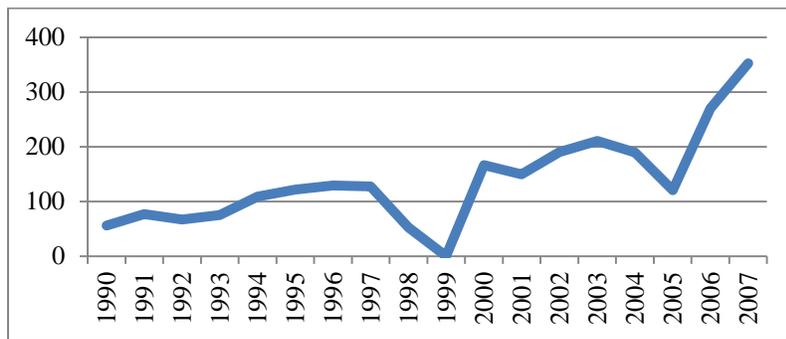
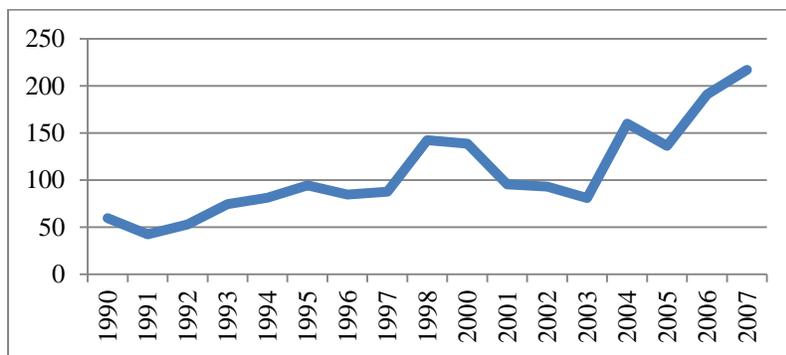


Figure 4: Bangladesh - Fish Exports to USA 1990-2007 (USD Millions)



Source for Figures 3-4: UN COMTRADE Database.

Poor Resource Management/Geographic Vulnerabilities

Destructive fishing practices have led to indications of an alarming fall in fish stocks - both in inland and marine fisheries. In 2006, the Ministry of Fisheries and Livestock commissioned the WorldFish Center to carry out a project to measure the change in marine fish stocks over time and after two years the latter confirmed that stocks are undeniably declining, and that the rate of decline seems to be accelerating (Hussain et al. 2010). This, combined with slowing growth in the inland capture sector (its contribution to overall production has fallen from 50 to 35 percent over the last decade) has compounded concerns of overexploitation. The number of freshwater species in Bangladesh is decreasing, with 54 of an estimated 320 species in danger of extinction, thus threatening the country's diverse stock of fish (Alam and Dey 2011).

This fall in the country's fish stocks, particularly of the most commercially popular species, is a result of poor resource management - both a lack of legislation and weak enforcement of the

few extant rules - and the negative environmental impact of human activities both in Bangladesh and in neighboring India. Participants in both artisanal and industrial fisheries exploit marine and inland resources without any real oversight by public authorities. Most of the governing legislation is focused on monitoring industrial trawling activity but the government has been unable to get the industrial operations to adopt sustainable fishing practices: while trawlers have officially been restricted from operating in waters deeper than 40 m - in an effort to protect the spawning ground of many of the commercially exploited shrimp species - they continue to operate even in waters as little as 10 m deep. This excessive fishing of juvenile and immature shrimp has unsurprisingly decreased the natural replacement rate and the catch per unit effort (CPUE) of shrimp (kg/day/shrimp trawler) has steadily decreased by about 50 percent since the early 1990s (Hussain et al. 2010). Moreover, government surveillance of fishing practices needs to be broader in scope - artisanal fisheries are completely unregulated even though they account for 90 percent of the marine capture catch and the majority of the aquaculture catch. The modernization of the artisanal sector in the last couple of decades - there are now as many mechanized fishing boats as traditional ones - has also resulted in the transfer of destructive gear and unsustainable practices from the industrial sector, putting even more pressure on fish stocks. Since the government might be unable to monitor the operations of artisanal fishers by deploying even more patrol units, some have suggested the formation of village surveillance communities who would work with the authorities to ensure sustainable fishing practices.

In addition to overfishing, Bangladesh has suffered from the negative ecological impact on the Ganges River caused by the construction of the Farakka barrage in India, completed in 1975. The subsequent gradual upstream diversion of the Ganges has resulted in excessive siltation along the coastline of the country as well as increased shoreline erosion - harming species that have not been able to tolerate the higher salinity level of the waters (Hussain et al. 2010). Plans by China and India to construct more dams along shared rivers will cause further ecological upheaval in a country that is especially vulnerable to environmental disasters. The construction of dams by neighboring countries in shared rivers combined with the over-exploitation of fish stocks underlines the gravity of the 'open-access' problem of water resources. In order to establish a more sustainable water resource management system, Bangladesh will have to find a way of establishing property rights among fishers and water-sharing rights and environmental

agreements with more powerful neighbors, possibly mediated by third party multilateral institutions.

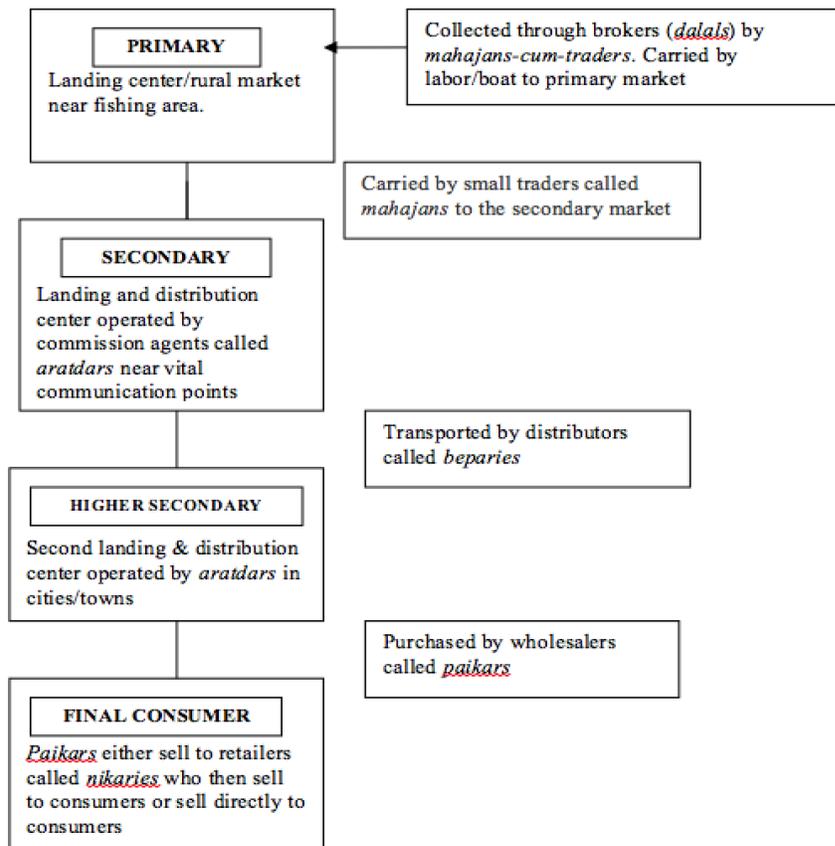
Complex Distribution Chain and Supply-Side Constraints

A very complex network of intermediaries between the artisanal fisher/fish farmer and the final consumer defines the typical fish distribution chain in Bangladesh, illustrated in Figure 5. Generally, fishers are unable to distribute fish themselves because of poor transport infrastructure and an absence of public cold storage facilities at landing sites, in addition to lack of clean water and reliable electricity (Dey et al. 2010). The fishers' isolation from the final consumer constrains their ability to obtain market information and higher profit margins. More importantly, artisanal fishers - often illiterate - are locked into a perpetual cycle of debt with *mahajons*, or local brokers, who offer credit in exchange for fish. Moving along the value chain, the *aratdars* - commission agents who conduct public auctions and often have icing facilities – generally gain the highest share of the margins. The limited number of *aratdars* means that the *mahajans* and *beparies* (the distributors) pay higher commissions, and the latter in turn further squeeze the margins of fishers upstream.

The distribution chain highlights some crucial deficiencies on the supply side that prevent the Bangladesh fish industry from reaching its full potential and producing high value, export-grade fish that could increase the incomes of the fishers themselves. First, the unavailability of public icing and cold storage facilities at landing sites leads to a high proportion of discarded catch and poor hygiene practices. Further, the absence of quality and well-connected roads from landing sites to wholesale markets makes the fishers even more beholden to distributors, and this limited connectivity results in squeezed margins for fishers. Recent improvements in roads and communication networks in urban areas have seen more fish farmers participate directly in the secondary market leading to shorter distribution chains. This trend augurs well for the fish industry given that in some areas 80 percent of fish farmers consider lack of information and poor distribution as main barriers to business (Dey et al. 2010).⁶

⁶ Capture fishers were not surveyed.

Figure 5: Bangladesh - Typical Fishery Product Distribution Chain



Source: FAO (2011)

Aquaculture and Diversification Opportunities

The growth of aquaculture in Bangladesh has been fuelled by important research findings from the Bangladesh Fisheries Resource Institute (BFRI). BFRI has developed and disseminated 45 different fish farm “technologies” and management techniques through its regional stations (Hussain 2010). Since 1988, when the institute initiated its fish genetics program, BFRI has developed strains of silver barb, Tilapia and Rohu that weigh 35 percent, 32 percent and 10 percent more than the respective non-genetically modified versions of these species. Moreover, other breakthroughs like the development of low-cost feed from indigenous ingredients and the distribution of improved management practices might have contributed to the extensive culture of cost-effective small-scale aquaculture systems for the large rural population: aquaculture has grown at an annual average rate of 9 percent from 1985 to 2009 (compared to around 4 percent for capture fisheries) with pond culture accounting for 86 percent of production (Belton et al.

2011; Hussain 2010). 73% of rural households are involved in aquaculture production, many with backyard pond culture systems that serve both as a source of income and subsistence (Belton et al. 2011; Dey et al. 2010).

To maintain the growth of aquaculture, the government and the BFRI need to address “abiotic” production constraints (i.e., those relating to water, soil and temperature, rather than biotic constraints like pests and diseases) faced by fish farmers. Research shows that the yield gap (the ratio of actual yields to best practice yields achieved in a research setting) of 52-54 percent, is due to flooding, soil erosion and low dissolved oxygen in freshwater sources (Dey et al. 2010). In order to improve the efficiency of the aquaculture sector, the BFRI would have to reorient its research towards the management of soil and water quality (Hussain 2010). Simultaneously, related government agencies and international donors could redouble efforts to establish training programs for fish farmers in order to boost production since Dey et al. (2010) report that technical training in aquaculture practices significantly increases the productivity of freshwater fish farmers: the “technical efficiency”⁷ of fish farmers who received training was found to be 86%, for those who were given credit it was 69%, and for those who received no training and no credit it was 61% (Arjumanara et al. 2004).

Aquaculture also presents opportunities to diversify exports away from frozen shrimp and prawn products. One such opportunity lies in striped catfish, or *Pangasianodon hypophthalmus* (*Pangasius*), which was introduced to Bangladeshi fish farms from Thailand in 1998 (Edwards et al. 2010). The species has become a low-cost alternative to the popular Indian carp *rohu*, and can be grown in small, shallow ponds unlike *rohu*. However, overproduction of catfish recently led to a market glut that has plunged farm prices below production costs (Edwards et al. 2010). Nevertheless, while striped catfish is currently only marketed to domestic consumers, catfish farms could process and export the fish, raising prices and incomes for producers. Production in Vietnam - the current major exporter - costs more than in Bangladesh so Bangladeshi producers could be encouraged to initiate catfish exports and diversify away from shrimp and prawn exports (Edwards et al. 2010).

⁷ Technical efficiency is referred to as the ability of a farm to obtain maximum output from a given set of inputs and technology (Dey et al. 2010).

Assessment and Lessons

Bangladesh, home to a diverse range of fish species and an established artisanal fishing tradition, has generally managed to overcome the most difficult export constraint - strict health and quality standards in major importing regions, particularly the EU - in the international trade of fishery products despite periodic bans on its products. Since the EC has not imposed a blanket ban on Bangladeshi fish exports since 1998, the recent contamination issues faced by shrimp exporters could be teething problems. Now Bangladesh faces another issue: excess capacity in fish processing due to declining resources. Ensuring sustainability through diversification and better management must go hand-in-hand with productivity growth. Even though domestic players now have access to these lucrative markets and domestic production has tripled in the last two decades, continued efforts to upgrade basic landing and transportation infrastructure, monitor fish stocks and prevent harmful fishing practices, and diversify exports, are needed to improve long-term incomes for stakeholders in the industry. Indeed, most industrial processing factories largely process shrimp and prawn - frozen shrimp and prawn exports account for 85 percent of exports by value (BBS 2010) - but operate at only 20-25 percent of capacity (Dey et al. 2010). A complex artisanal distribution chain prevents most traditional fishers from supplying to these industrial-grade factories. Investment in cold chains and improving the quality of the road network will go a long way towards reducing the fishers' dependence on middlemen and increasing the quantity of fish supplied to processing factories. Continued research and investment in aquaculture is an important means of boosting productivity, equity, and sustainability.

6. Cambodia

Overview

The fisheries sector in Cambodia plays a crucial role in the country's economy. According to most recent estimates, Cambodian capture and aquaculture fisheries produce around 527,000 tons of fish, worth between USD 1.2 - 1.6 billion (FAO 2011; Nam 2008) annually. Fishery production (not including processing and other related activities) thus makes up around 10 percent of Cambodia's overall GDP. The fisheries sector also provides full-time, part-time and seasonal employment for up to 6 million people - approximately 40 percent of the population -

in capture and subsequent value-adding services (Sothorn et al. 2011). In addition to being a major driver of livelihoods in a country where 80 percent of the population lives in rural areas, the fisheries sector is vital for Cambodia's food security: on average, fish provides around 80 percent of daily animal protein consumption for Cambodians.

Nevertheless, fish exports are a small proportion of production and recent policy changes by the government have caused exports to decrease even further. As Figure 6 shows, aside from a temporary increase in the early 2000s attributable to the break-up of KAMFIMEX, a state enterprise that had the sole distribution rights for all fish trade into and out of Cambodia (more on this in the *Export Constraints* section below), the recorded value of exports has declined over the last decade. Even though there are discrepancies between data released by different government bodies on both the volume and value of fish exported annually, it is evident that fish exports from Cambodia account for a negligible share of the international trade in fish products. The Cambodian Fisheries Administration (FiA) estimated the total volume and value of fish exports to be around 30,000 tons and USD 60 million, respectively, in 2011 (Xinhua 2012) far above the Ministry of Commerce (MOC) figures of fish exports and value of around 1,600 tons and USD 3.5 million respectively (Phnom Penh Post 2012).⁸ The lack of coordination between the two departments does not obscure the general downward trend in fish exports. While the FiA numbers have consistently been about ten times greater (probably more accurately representing actual trade given the large amount of unrecorded activity) than those released by MOC through the last decade, officials from both government departments suggest that policies introduced in 2010 have diverted exports towards the domestic market in order to meet rising local demand (Phnom Penh Post 2012). In fact, fish exports from Thailand and Vietnam - richer, more populous immediate neighbors with longer coastlines as well as established processing centers - have significantly eclipsed those from Cambodia. The trivial volume of exports and the lack of government support for industrial fisheries explain the volatile trade flows to Cambodia's main export partners as shown in Table 14.

⁸ The UN COMTRADE Database puts the value of official fish exports at USD 3.13 million in 2011, seemingly supporting the second figure.

Figure 6: Cambodia - Total Official Fish Exports by Value 2000-2012 (USD Millions)

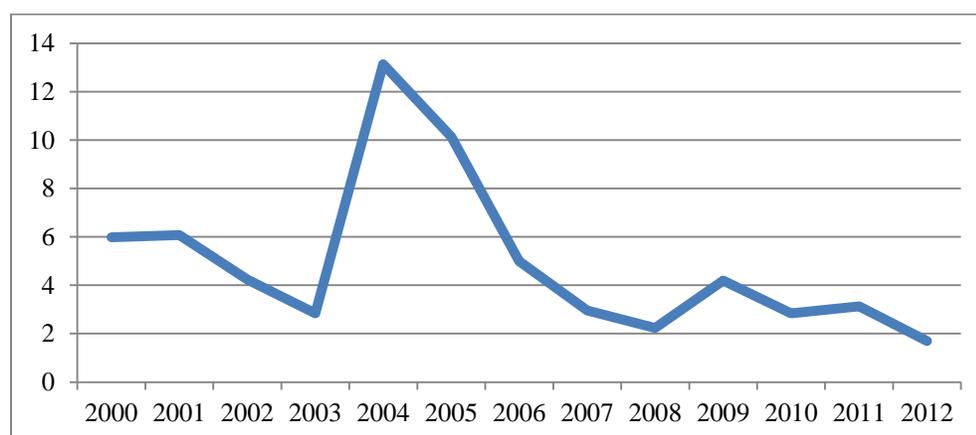


Table 14: Cambodia - Official Fish Export Flows by Destination 2000-2012 (USD)

| | Australia | China | Japan | Vietnam | Thailand | USA |
|------|-----------|-----------|-----------|---------|----------|------------|
| 2000 | 89,891 | 1,161,183 | 81,089 | 211,743 | 807,329 | 166,153 |
| 2001 | 322,817 | 1,839,060 | 13,335 | 26,643 | 440,469 | 36,777 |
| 2002 | 242,392 | 1,299,124 | 18,291 | 54,505 | 246,397 | 71,124 |
| 2003 | 188,235 | 658,674 | 493 | 116,678 | 201,864 | 222,228 |
| 2004 | 155,527 | 393,779 | 528 | 53,704 | 460,043 | 11,214,506 |
| 2005 | 82,032 | 265,023 | 20 | 3,357 | 717,412 | 8,343,792 |
| 2006 | 40,323 | 428,815 | 0 | 41,596 | 733,424 | 3,360,282 |
| 2007 | 0 | 351,587 | 10,900 | 0 | 462,627 | 1,425,315 |
| 2008 | 0 | 314,874 | 30,080 | 0 | 136,967 | 1,242,374 |
| 2009 | 8,350 | 280,669 | 0 | 43,064 | 102,488 | |
| 2010 | 17,884 | 510,353 | 541,117 | 81,324 | 0 | 745,364 |
| 2011 | 10,480 | 692,510 | 1,375,768 | 64,917 | 20,620 | 624,512 |
| 2012 | 0 | 619,867 | 593,321 | 177,933 | 51,281 | 552 |

Source for Figure 6 and Table 14: UN COMTRADE Database.

The Importance of Inland Fisheries

Inland freshwater capture fisheries contribute the majority of Cambodia's fish supply, accounting for 422,000 of the 527,000 tons obtained in 2008, with marine fish captures of 65,000 tons and aquaculture harvest of 40,000 tons. Cambodian inland fisheries are highly productive due to the annual flooding of the Tonle Sap (or the Great Lake) - Southeast Asia's largest freshwater lake - during the rainy season the lake expands to 3-5 times its normal size, temporarily occupying approximately 44 percent of the country's total area (ADB 2005). This is

due to a unique hydrological phenomenon whereby the rise of the water levels of the Mekong and Tonle Sap rivers reverse the latter's flow, draining it into the lake and creating one of the world's most productive capture fisheries regions. Every year the Tonle Sap contributes approximately 50 percent of Cambodia's capture production with the value of catch reaching USD 250 - 500 million as it passes through the value chain (ADB 2005; Mensher 2006). The Lake also traditionally accounts for about a quarter of Cambodia's fish exports as many fishers cross the porous amphibious borders to sell their products unofficially to Thai traders (ADB 2005). More importantly, the wetlands and flooded forests act as a fertile spawning arena for a diversity - at least 200 species - of fish, including the endangered giant catfish (ADB 2005; Mensher 2006). Cambodia is thus able to supply a large quantity of freshwater fish species to Vietnamese and Thai markets where processors add value and prepare the fish for re-export to major importing countries (Rab et al. 2004).

Export Constraints

The volume of production - 422,000 tons per year - makes Cambodia's inland fisheries the fourth largest in the world after those of China, India, and Bangladesh (ADB 2005; FAO 2011b). Nevertheless, since 2000 this natural endowment is increasingly threatened by over-exploitation of fish stocks. Overfishing has been driven by a combination of systemic factors that have resulted in the gradual environmental degradation of the Tonle Sap basin. Until the government-initiated expansion of fishing communes starting in 2000, access to Tonle Sap had been governed by the 1987 Fisheries Law which divided the majority of the common pool resource into publicly auctioned commercial lots with a few open access areas for the benefit of rural communities (Mensher 2006). The government sought to eliminate the problem of the 'commons' with the establishment of private lots but these measures backfired. Lot owners frequently sub-let access to an excessive number of fishers, and where there was common access, competition amongst small scale fishers to stake out the best areas resulted in the rise of housing communities on stilts in the best spots for fishing (Mensher 2006). The subsequent soil erosion was worsened by destructive harvest methods employed by the large share of IUU fishers operating in the industry. The increasing use of the 'samra' method of harvesting fish, which involves cutting tree branches and installing them in the water with seine nets, resulted in

the loss of habitat for many migratory fish species that use the roots of trees as spawning territory during the annual flooding of the Lake (Mensher 2006).

The overfishing and sedimentation contributed to a decrease in the catch per fisher in Tonle Sap by around 41 percent over 1995-2008. Inadequate infrastructure and excessive government control over the distribution of exports also inhibit Cambodia's export potential (Nam 2008). Inadequate storage, handling and packaging facilities at landing sites and unawareness of modern processing methods or international hygiene standards amongst the large number of small scale fishers has hampered the transition from artisanal to industrial fishing. Moreover, all exports had to be sold to KAMFIMEX until the early 2000s discouraging homegrown operations from accessing lucrative export markets (Rab et al. 2004).

Cambodia currently does not have access to the EU market because of non-compliance with HACCP inspection systems, but the country showed considerable export potential beginning in 2001-2005 when the KAMFIMEX monopoly was first relaxed in order to incentivize private sector participation in fish exports. An almost 30 percent rise in fish exports was recorded during this period as shown in Figure 6 above, partially because a substantial share of previously unrecorded trade was brought into the purview of the official system (Van der Meer & Ignacio 2007). As of 2002 though, Cambodia only had four processing factories that held export permits, of which one was owned and operated by KAMFIMEX itself. A Cambodian firm called Liang Heng Trading Company operated two and Sun Wah, a Hong-Kong based conglomerate, operated the third (Rab et al. 2004). The scarce information that is available on the industrial sector suggests that the landscape has not changed much since 2002. In a mid-2013 press release, Sun Wah's Chairman blamed a long-standing 10 percent export tax on seafood as a major obstacle to the growth of a modern processing and export sector in Cambodia (Lewis & Chan 2013). In fact, Sun Wah has recently scaled back its presence in Cambodia by reducing its factory staff from "more than a several hundred to [less] than 100" and operating "seasonally" due to limited supply of high quality catch (Cambodia Daily 2013).

Changes in Government Policies Create Opportunities

Over the last decade, Cambodia's Ministry of Agriculture, Forestry and Fishery has encouraged the development of sustainable fishing practices and promoted cooperation rather than

competition in the country's fisheries industry. In August 2011 the Prime Minister announced the phasing out of all commercial lots in Tonle Sap in favor of the community fisheries that have gradually been established by the government over the last decade (WorldFish 2013). This policy shift has received a seal of approval from the international community, as a number of donors, including the European Commission, Danida, WorldFish and the US government, have rushed in to provide financing and training for these 'co-management' communes (WorldFish 2013; Sothorn et al. 2011). The promulgation of a new Fisheries Law combined with the establishment of a 'Strategic Planning Framework for Fisheries 2010-2019' has also strengthened the regulatory regime governing the conservation of Cambodia's fisheries (Nam 2008; Nam & Bunthang 2011; Sothorn et al. 2011). Furthermore, the government's Strategic Framework has outlined its ambition to develop the aquaculture sector to boost both food security and the volume of exports.

Even though exports have decreased over the last two years after the government took steps to divert production to the domestic market in response to political pressure (MOC data show that exports fell from USD 3.1 million in 2011 to USD 1.7 million in 2012 while FiA data indicate a decline from USD 60 million to USD 40 million during the same period), the Director-General of the FiA, still expects Cambodian fish exports to be worth USD 1 billion by 2019 (Phnom Penh Post 2012; UN COMTRADE; Xinhua 2013). While this may be an overly optimistic prediction, a rapidly growing aquaculture sector and increased focus on sustainable fishing practices may help the authorities build the capacity to implement HACCP-compliant systems in the long run. Moreover, the rapid growth of aquaculture in Thailand and Vietnam, which fuelled their rise as the top exporters in the world, has plateaued over the last few years - providing an opening for Cambodian exporters to gain market share in the regional trade for fish products (WorldFish 2011). The potential opportunities available with the advent of the 2015 ASEAN Economic Community (AEC) provides further basis for improved intra-regional export performance. Collaboration with the private sector - both industrial and artisanal - to develop an industry-wide capacity to meet international requirements in the quality and handling of fish does not even seem to be on the government's agenda, thus hindering any intention or efforts to boost exports to the most lucrative foreign markets in the foreseeable future. In fact, the EC proposed a ban on all fish imports from Cambodia in late November 2013 in response to IUU fishing by vessels bearing the Cambodian flag (Xinhua 2013). While the ban will not impact

Cambodian exports because the country's fish exporters have never been able to sell their products to the EU, the dent in Cambodia's reputation and the worsening of relations between the Cambodian government and the EC might hamper opportunities for exporters to access the EU market any time soon.

Assessment and Lessons

The fishing industry has made some progress following the institutional reforms begun in 2000, particularly the relaxation of the KAMFIMEX monopoly and the community-based initiatives to control overfishing and environmental degradation. Despite the significance of the sector - the fish industry provides employment for 40 percent of the population - Cambodia's fish exports make up a relatively small proportion of overall production. Cambodia's fisheries are far behind the neighboring Vietnamese and Thai fisheries industries in the global market. The country's poor institutional climate and lack of processing capacity ensure that its mainly artisanal fishers supply the processing centers in Vietnam and Thailand, limiting domestic value-added. Even though the government has strengthened its regulatory mechanisms, it needs to make room for the private sector to develop a modern processing sector, and make a commitment to building the institutional and industrial capacity to meet international quality and safety standards.

7. Comoros

Overview

The Comoros consists of a group of three small islands off the East Coast of Africa in the Indian Ocean, with a total population of about 800,000 in 2011. Following independence from France in 1975, the country has suffered from numerous changes of government, but since 2009 political stability has improved, enhancing the prospects for economic development. As in many African LDCs, the population is very young and creating remunerative employment opportunities for new entrants to the labor force is a major challenge. Fishing is the second most important sector of the economy after agriculture, accounting for 6 percent of employment and 12 percent of GDP (Integrated Framework 2007). The government's poverty reduction strategy paper (IMF 2010) prioritizes the fishing sector.

Artisanal and industrial fishing at present operate in completely different realms, to a greater extent even than in most LDCs. Industrial fishing is conducted entirely by Distant Water Fishing Nations (DWFN), with all domestic fishing operations being artisanal. Foreign vessels, mainly purse seiners from Spain and France, fish offshore for several varieties of tuna and swordfish. No fish caught by DWFN is landed in Comoros due to the lack of infrastructure and processing facilities, and there are no exports from domestic fishers. The main local benefit from these DWFN operations comes from the fees that European Union and other foreign entities pay to Comoros. Local fishers operate in a circumscribed 900 km² area on the continental shelf, for a large variety of demersal and pelagic fish, of which the most important are mackerel, anchovies, white marlin and cuttlefish.

Tuna Fishing

The Comoros is situated on the Indian Ocean migration path of tuna and swordfish, the main targets of industrial fishing off the coast of East Africa. The Indian Ocean Tuna Commission (IOTC) has found that tuna species are not overfished, although swordfish is showing signs of overexploitation.

Comoros and the European Union have had agreements on fishing since 1988, renewed every three years, specifying the numbers of European boats allowed to fish off Comoros and the maximum tonnage of their capture in exchange for an annual fee.

The EU and Comoros are in the process of renewing the expiring fishing accord. The EU provides 615,000 Euros annually for fishing rights and another 161,000 Euros in other fees and payments for a total of close to 800,000 Euros, small but not negligible relative to development assistance of nearly 10 million Euros (European Union 2013, Table 6.8, p. 78). Given the estimated annual captures of 3582 tons of tuna, that amounts to 217 Euros per ton, or about 15 percent of the wholesale price of tuna estimated at 1400 Euros per ton. The European fishing companies contribute 45 Euros per ton and the EU the remaining 172 Euros. Perhaps most significantly, 300,000 Euros are earmarked for development of domestic fishing, thus providing a vital source of funding for modernization of the industry. Equally significant, the accord includes technical assistance in planning and oversight of the sector, monitoring fishing stocks,

and implementation of infrastructure investments. The EU, the IOTC and the regional governments work together to ensure foreign fleets follow sustainable fishing practices.

Laffaire (2009) argues that the European Union has disproportionate power relative to Comoros in negotiating agreements and that these accords have failed to develop the domestic industry, but these accords provide a tool for transforming the still-primitive conditions of Comorian fishing. Moreover, the EU fishing agreements are transparent with the provisions spelled out in detail. Indeed the World Bank (2012) notes the transparency of EU fishing accords relative to those of other countries. The European Union's (2013) review of the accord suggests that the funding provided to Comoros could perhaps be tied to the price of fish, which would be to Comoros' advantage if prices continue to rise. In addition, the review suggests a number of areas for reinforced technical assistance, particularly for improving the domestic capacity for management and surveillance of fishing, including combating illegal fishing. Overall, therefore, the fishing agreement with the EU seems reasonably fair and transparent, serving the mutual interest of the Comorian economy and government and the European Union fishing industry. The EU also suggests extending the current three-year duration of previous accords, which appears to be a sensible suggestion.

Since 2005, tuna fishing off East Africa has been disrupted by Somali piracy. The number of purse seiner vessels operating in the region dropped from 55 in 2001 to 35 in 2011. The routes these boats have used have also been modified to avoid the zones in which pirates are most active. The number of longliners operating in the region has dropped more sharply, by 50 percent since 2007, as they are more vulnerable to piracy than purse seiners. Currently no longliners are operating off Comoros, although the EU accord allows them to do so.

Consequently total captures of fish in the West Indian Ocean have dropped considerably, although to varying extents in different areas. Comoros has been less affected than most other countries. The positive aspect of this reduction of tuna fishing is that fish stocks are at healthy levels (European Union 2013). Recently, piracy has declined due to use of armed guards and use of alternative routes.

Unlike other countries in the region, tuna fishing creates no employment for Comorian nationals, as no fish caught in Comorian waters are unloaded onshore. European ships either bring their catch directly back to Europe or unload for processing in neighboring countries with

better infrastructure and handling facilities, mainly Seychelles, Mauritius, Madagascar and Kenya. No Comorian observers are on board, contrary to normal EU fishing procedures and the accord with Comoros, due to the unavailability of experienced personnel. Instead nationals from other developing countries with greater experience substitute for Comorians. In addition the need for armed guards on board to defend against piracy reduces room for local observers (European Union 2013).

Artisanal Fishing

Domestic fishing is largely an informal, subsistence activity but has partially transitioned from “traditional” to “artisanal” (Integrated Framework 2007). Most fishers still use traditional wood canoes, but over the last twenty years small motorized fiberglass boats have been introduced into artisanal fishing, and now account for about a third of the boats. The 8,500 fishers represent 6 percent of the population; another 24,000 people are involved indirectly (Laffaire 2009). Traditional canoes stay very close to the coast where fishing resources are more limited. The availability of motorized boats along with fish aggregating devices has enabled fishers to go further offshore and obtain some varieties of tuna, substantially increasing the catches of artisanal fishers. A small mostly foreign-owned semi-industrial fishing operation registered in Comoros goes further out to sea, but mostly lands its catch in other countries. A number of lucrative fish species are currently under-utilized, including cephalopods, shrimp and lobster (Laffaire 2009).

Serious obstacles inhibit the development of a modern export-oriented fishing industry that can generate rising incomes for the local population (Integrated Framework 2007). There is a near complete absence of domestic infrastructure, particularly the cold chain. Whatever refrigeration occurs is limited to residents’ private freezers, and even this is hampered by the high cost and frequent outages of power (Laffaire 2009). Lack of access to finance for investment in boats is also a constraint to upgrading the fishing fleet from canoes to fiberglass and increasing the size of boats so they can go further and stay longer in the ocean. Human capital in both public and private sectors is also weak.

Domestic Fish-Processing

Very little processing occurs on land in Comoros, even for artisanal fishing, due to lack of landing and cold-chain facilities and know-how. Most fish caught by artisanal fishers is sold directly to the local population, and as already noted, foreign vessels do not land fish in Comoros. In an encouraging development, however, a tuna-processing facility is under construction, under a mixed public-private venture from Qatar and Sri Lanka. The government envisions several other steps to promote additional local processing, including construction of larger boats, a quality-control laboratory, and a new fishing school (European Union 2013).

Institutional Structure

Comoros has a very limited institutional structure overseeing fishing. A fishing code was adopted in 2007, with assistance from the FAO. There is no official legal framework regarding Comoros' Exclusive Economic Zone (EEZ). The situation is complicated due to the fact that one of the islands in the Comoros Archipelago remains a French possession (Mayotte) and Comoros' EEZ overlaps with Madagascar, Mozambique, Tanzania and the Seychelles (European Union 2013). Comoros' legislation governing foreign ships' operation in Comorian waters is quite flexible.

The IOTC is the most important of several inter-governmental agencies governing fishing the Western Indian Ocean. Cooperation with other governments in the region is also important and improving. Recently the governments of Comoros and Seychelles announced an agreement on fishing.⁹

The Department of Fishing within the Ministry of Agriculture, Fishing and the Environment is responsible for domestic policies towards fishing. Despite funding from several external sources including the European Union, the International Fund for Agricultural Development, Japan, Qatar, and the World Bank totaling about 10 million Euros, government human and resources are lacking (European Union 2013).

⁹Republic of Seychelles, Ministry of Foreign Affairs, "Les Seychelles et les Comores renforcent leur cooperation en matière de pêche," http://www.mfa.gov.sc/static.php?content_id=36&news_id=193

Assessment and Lessons

Relative to other countries in the region, fishing in Comoros is underdeveloped but shows considerable promise for growth. Comoros currently has no domestic processing and no exports, as domestic fishing is almost entirely artisanal and foreign vessels do not land their catch in Comoros. All of this is gradually changing, as Comoros develops its infrastructure and capabilities and foreign investment in domestic processing is beginning. The Qatari-Sri Lankan investment in tuna processing under construction is a promising start.

Comoros is lacking in the hard and soft infrastructure required to compete in fishing. Fishing policy is handicapped by lack of information about fishing stocks, the scale of fishing efforts and fish captures. This applies to offshore tuna fishing and even more to high-value demersal products such as lobster, octopus and other cephalopods (Integrated Framework 2007).

According to the European Union (2013, p. 92) this information is currently being gathered and if so, it will enable a better assessment of the availability of fish and the sustainability of current fishing operations.

To achieve the goal of becoming an exporter of fish to the European Union, reforms will be necessary in administration of fishing along with stepped-up investment in infrastructure.

Comoros lacks a legal framework for the fishing industry and institutional mechanisms for oversight of sanitary control at all stages of production, including capture, processing, and marketing. In addition, Comoros must develop and implement a national strategy to control IUU fishing. This requires maintenance of registry of national and foreign ships authorized to fish in Comoros. Eventually, Comoros will also have to ensure that a certificate confirming that capture occurred under legal conditions accompanies all fish exported to the EU. At present all these conditions are moot, since Comoros is not yet exporting fish to Europe. The priority therefore is to establish a viable Competent Authority recognized as such by the EU. This will require additional resources and technical capacity building for the Department of Fishing. More generally, additional efforts are required in training and infrastructure, notably in landing sites, roads and the cold chain.

Comoros is in competition with other more developed countries in the region for processing facilities and should not move too fast in promoting its domestic industry, developing local offshore artisanal fishing and then transitioning to semi-industrial fishing operations (Integrated

Framework 2007). It should continue to progressively upgrade its human and physical resources with the aid of the European Union and other partners, while maintaining political stability and improving the domestic business climate more generally, especially the supply of electric power. If the government and donors are able to invest in fishing-specific and generalized infrastructure and human capital, foreign and domestic investment will accelerate on its own.

Notwithstanding the fact that foreign boats have minimal direct impact on Comoros and create no jobs for Comorians at present, the accord with the European Union is of crucial importance for the Comorian fishing industry in promoting modernization and sustainability.

9. Sierra Leone

Overview

Sierra Leone's fisheries industry has gradually emerged from the wreckage of a decade of civil war (1991 – 2001). Today the fisheries sector contributes approximately 8 percent of the country's GDP and is estimated to provide about 80 percent of annual animal protein intake for Sierra Leoneans (EEAS). Sierra Leone has a diverse range of pelagic and demersal fish species with considerable stocks of bonga, sardinella and lati constituting the former and stocks of barracuda, sole and threadfins comprising some of the latter (BFS 2010). Sierra Leone is also endowed with many different types of shrimp and tuna - two of the most heavily consumed fish species in international markets (BFS 2010).

While the majority of fish production is attributable to the artisanal sector, the fleets of a handful of DWFN - the majority from China and South Korea - make up the industrial fisheries sector, with close to zero participation by domestic players. This makes the policy framework governing offshore fishing rights a vital aspect of the further development of the sector. Indeed, the DWFN fleets operating in Sierra Leone's EEZ harvest, process and distribute most of the fish exports that come from the water resources of the country without even landing the catch on the nation's shores, as in Comoros. The artisanal sector plays an insignificant role in the distribution and processing of high value species to developed markets: most of the foreign exchange is earned by the foreign fleet and not by domestic stakeholders. In fact, the last

recorded data on exports provided by the government in 2005 showed exports amounting to only USD 120,000 (World Bank 2006c). On the other hand, the value of the fish caught and exported by the offshore vessels operating legally in Sierra Leone's EEZ is estimated to be around USD 20 million. IUU fishing by pirates or foreign fleets is likely larger at about USD 30 million per year (EEAS undated). Nevertheless, the absence of the DWFN fleet during the civil war period prevented the overfishing that many other LDCs continue to face in their domestic sectors.

Offshore Fishing Rights

Currently the government sells rights to fish in the EEZ to DWFN in exchange for license fees based on vessel capacity (World Bank 2006c). Since the government is unable to provide the infrastructure or know-how for local players to meet international quality and safety standards, the country is beholden to these arrangements with foreign enterprises in order to accrue earnings from exports to developed nations. Moreover, the revenues gained from these types of licensing contracts often result in the government getting a small share, generally 10 percent, of the landed value of the fish products (often even lower for arrangements with Chinese and Korean fleets) (Gagern et al. 2010). Even though Sierra Leone has preferential access to both the EU and the US under the Everything But Arms (EBA) scheme and the African Growth and Opportunity Act (AGOA), respectively, the inability to meet international standards means that these duty-free opportunities are unused (World Bank 2006). The absence of adequate monitoring, surveillance and data collection systems has worsened the government's negotiation power vis-à-vis determining the terms of the contracts with DWFN.

Without accurate knowledge about the value of export earnings and the exploitation of fish stocks, the Sierra Leone government cannot bargain for better terms or ensure the health of its marine fisheries. Indeed, despite a EU ban on Sierra Leone-origin fish exports from 2000-2009 and export approval currently only for fish caught by EU or ACP-registered ships in the EEZ, many other DWFN often land their harvest in the Spain-administered island of Las Palmas off the coast of West Africa to skirt these regulations and benefit from the high prices in the European market. The domestic sector receives none of these earnings (BFS 2010). Furthermore, Chinese and Korean trawlers harvesting increasing amounts of shrimp have started encroaching

upon coastal waters demarcated only for artisanal fishers, adding to pressure on fish stocks. In response, the government could consider selling licenses for offshore rights that link compensatory revenues to catch volume or value to obtain higher revenues and increase oversight of the fishing practices employed by DWFN fleets (World Bank 2006c). A volume-based metric would incentivize the authorities to more effectively monitor any contractual violations and encourage data collection. With assistance from the Environmental Justice Foundation, the government has implemented “community surveillance patrols” - providing cameras, GPS devices and radios to local fishers - that have been quite successful in preventing trawlers from entering protected areas: since 2010, more than 252 illegal fishing cases have been dealt with and the government has collected close to half a million US dollars in fines (Undercurrent 2013).

Supply-Side Constraints and Roadmap Ahead

While production and exports have increased since the end of the civil war, the Sierra Leonean government will only be able to leverage the fisheries industry as an engine for growth if it enhances the contribution of domestic stakeholders, gradually indigenizing the sector and disengaging from agreements with DWFNs in the long term. Thus in the immediate future, the government could try to improve their contractual terms with foreign fleets and re-invest the higher access fees into improving landing, transportation and cold storage infrastructure. Local players cannot exploit the full potential of the fisheries industry because the deficient infrastructure, combined with the underdeveloped financial system, makes the costs of preserving/processing and distributing fish to domestic and regional markets prohibitively high (Belloc et al. 2012). Artisanal fishers and processors, in addition to being hampered by the unfavorable institutional environment, lack the knowledge to adhere to HACCP procedures. Thus, foreign donors and multilateral institutions could assist the government in establishing training programs and providing funds to simultaneously improve the quality of infrastructure and increase awareness of international safety and quality standards.

7. Uganda

Overview

Approximately 44,000 km of 241,000 km - about 18 percent - of Uganda's total surface area is covered by water (World Bank 2006b). Indeed, even though it is land-locked, Uganda has many inland fishery resources with most capture fisheries based in five major lakes: Victoria, Kyoga, Albert, Edward and George. The first three lakes together contribute about 95 percent of the country's total annual catch while Lake Victoria alone contributes about half of the total annual catch. The major species caught in these lakes are Nile perch, tilapia and mukene with the former two accounting for the majority of fish exports to extra-regional markets whilst the latter is generally traded heavily in the immediate Great Lakes region, mostly unrecorded.

Uganda has a long artisanal fishing tradition (an estimated 80 percent of fishers can be categorized as artisanal) but its fisheries industry only began to grow - along with the rest of the economy - in the late 1980s after the country emerged from a tumultuous period of civil war (UNEP 2006). Officially recorded fish exports grew from around USD 1 million in 1990 to over USD 45 million just six years later (Ponte 2007), peaking in 2005 at around USD 143 million, but declining since then with the most recent annual value (2010) of exports amounting to USD 120 million (FAO database; Fish Site 2008). Figures 7 and 8 show the sharp increase in exports through late 1990s into mid-2000s and the subsequent decline resulting from falling production. Total annual production ranged between 200,000 - 250,000 tons through the 1990s into the mid-2000s but persistent overfishing, capture of immature fish and pollution of Lake Victoria over the last decade has led to increasing concerns about declining fish stocks in capture fisheries while the dramatic fall in exports has compounded these fears (DFR 2011; FAO database). As Table 15 shows, the total catch from Lake Victoria has fallen since 2005 from 238,533 tons to 183,824 tons in 2011 (NaFIRRI 2012). Government policies to control unsustainable fishing practices - the promulgation of new regulatory laws, stricter licensing and equipment requirements and reorganization of community-level monitoring bodies - seem to have stabilized production in 2012 and 2013 according to latest reports (Fish Site 2013).

Figure 7: Uganda - Volume of Exports 1991-2010 (Tons)

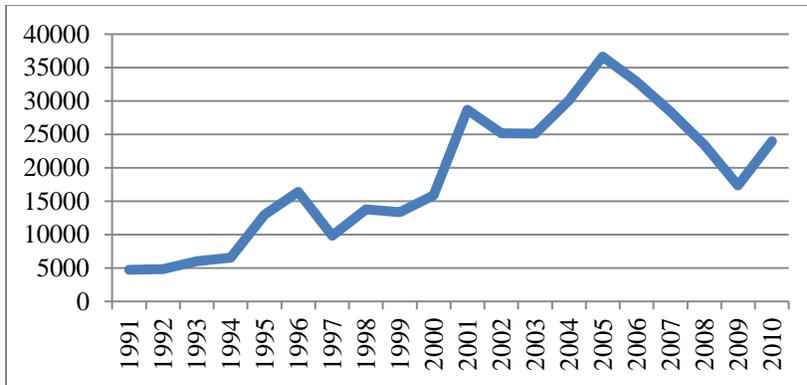
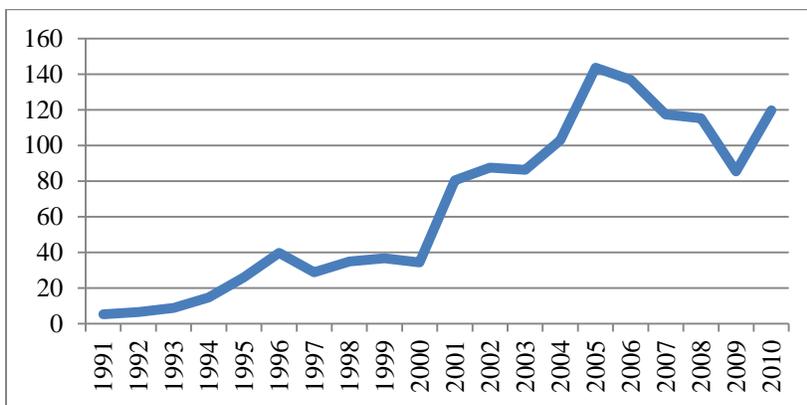


Figure 8: Uganda - Value of Exports 1991-2010 (USD Millions)



Source for Figures 7-8: UN COMTRADE Database

Table 15: Uganda - Estimated Annual Catch, Lake Victoria 2005-2011 (Tons)

| Year | 2005 | 2006 | 2007 | 2008 | 2010* | 2011 |
|--------------|---------|---------|---------|---------|---------|---------|
| Catch (Tons) | 238,533 | 215,943 | 227,487 | 173,024 | 162,929 | 183,824 |

Source for Table 15: NaFIRRI (2012).

Despite the recent decline, the fish industry remains the second largest foreign exchange earner for Uganda after coffee and contributes to the livelihoods of close to 1.5 million people, or about 4 percent of the population (Fish Site 2009). Nile perch accounts for 90 percent of official fish export earnings. The EU is the largest market for Ugandan Nile perch, followed by Australia, USA, South East Asia, the Middle East and Africa (Maurice 2011). As Figures 9 and 10 below show, export flows to the major destinations generally resemble the overall trend of rising exports until 2005. Informal exports to neighboring countries are estimated to have increased from USD 60 million in the mid-2000s to closer to USD 70 million in the late 2000s (DFR 2011). These exports are largely comprised of undersized or immature fish that are

distributed through non-HACCP compliant value chains.

Figure 9: Uganda - Exports to EU 1994-2012 (USD Millions)

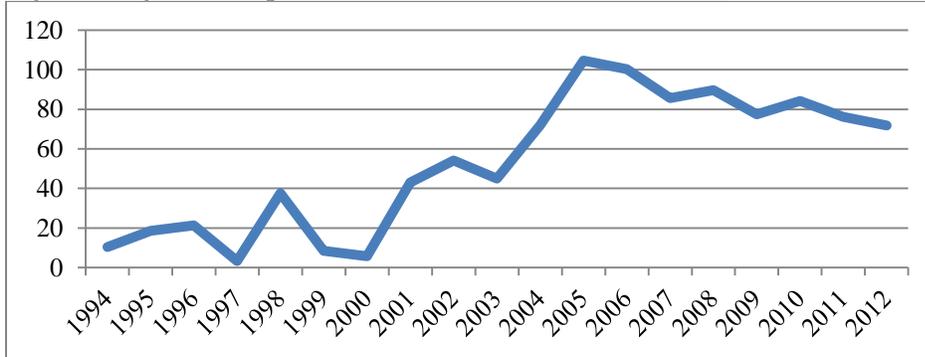
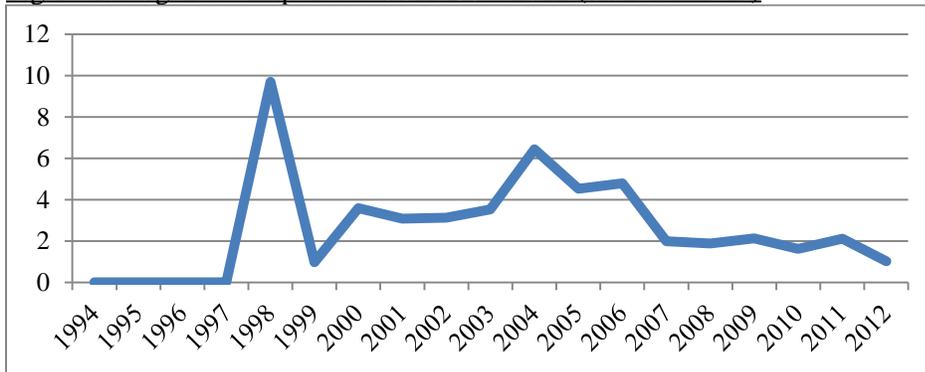


Figure 10: Uganda - Exports to USA 1994-2012 (USD Millions)



Source for Figures 9-10: UN COMTRADE Database.

Nile Perch: Exports to EU & Industrial Processing

In 1991 the Ugandan government banned exports of unprocessed fish, seeking to provide the initial stimulus for the growth of local processing operations (Ponte 2007). While it is unclear whether the ban played any major role in the subsequent success of the industry, it is more certain that declining stocks of ‘groundfish’ species, particularly cod and haddock, in Europe during the 1990s created an opportunity for Ugandan exporters. The diminishing stocks of European groundfish increased demand from European consumers for groundfish from foreign markets, and the following rise in demand for Nile perch - similar to groundfish of “neutral flavor” - has very much driven the Ugandan formal fish export sector. More recently, however, Nile perch exports have declined partially due to overfishing and emerging competition from

exports of similar species from other countries. The rapid increase in the global supply of farmed salmon - and the ensuing price decrease - has made salmon a viable substitute to Nile perch . The rise of farmed cod from Vietnam has also dented the EU market share of Nile perch exports from Uganda .

Uganda is one of the few LDCs that have permission to export fish into the EU but this was not always the case. Between 1997 and 2000, the EU imposed three export bans on fish from Uganda because of safety and quality issues (UNEP 2006). Initially, in early 1997, Spain and Italy banned fish from Uganda because they detected salmonella in the imported fish. Then, a severe cholera epidemic on landing sites around Lake Victoria led to a complete ban of fresh-chilled fish products in December that year. As 95 percent of the fish exported to the EU that year were chilled fresh fish this basically amounted to a total ban on all fish exports to the EU. Furthermore, a fish-poisoning scare in early 1998 led to a ban on all fish exports from Lake Victoria. An assessment of the fish sector by EU inspectors highlighted several issues that prevented Uganda from meeting the EU quality and safety standards. First, the inspectors identified the lack of coordination between the ‘competent authority’ - the DFR - and the Ugandan National Bureau of Standards (UNBS). Second, the EU assessment pointed to the absence of laboratory facilities for chemical and pesticide analysis and outdated regulatory laws (the Fish Act of 1964) as further constraints. Lastly, the inspection team highlighted unhygienic handling of fish in the subsector as a significant problem as well: uninformed fisheries officers were said to be ignoring instructions regarding the handling of fish and most landing sites did not meet minimum EU quality and safety requirements.

The bans catalyzed government-led reform of the fisheries sector. The Ugandan government invested in training programs and disseminated an inspection manual for official inspectors while providing new equipment for landing sites managed by the government. Technical support in adhering to HACCP systems was also provided to the DFR, UNBS, and private sector players by donors. Donors, together with the government, also invested in public sector owned chemical inspection laboratories while Chemiphar Uganda, a privately run laboratory, was approved for pesticide residue analysis. These measures led to the lifting of EU bans on Ugandan fish exports in 2001 and the DFR was designated as the EU competent authority that monitors quality and safety throughout the value chain (UNEP 2006). In 2004, a National Fisheries Policy was implemented to replace the Fish Act (1964) to establish an updated

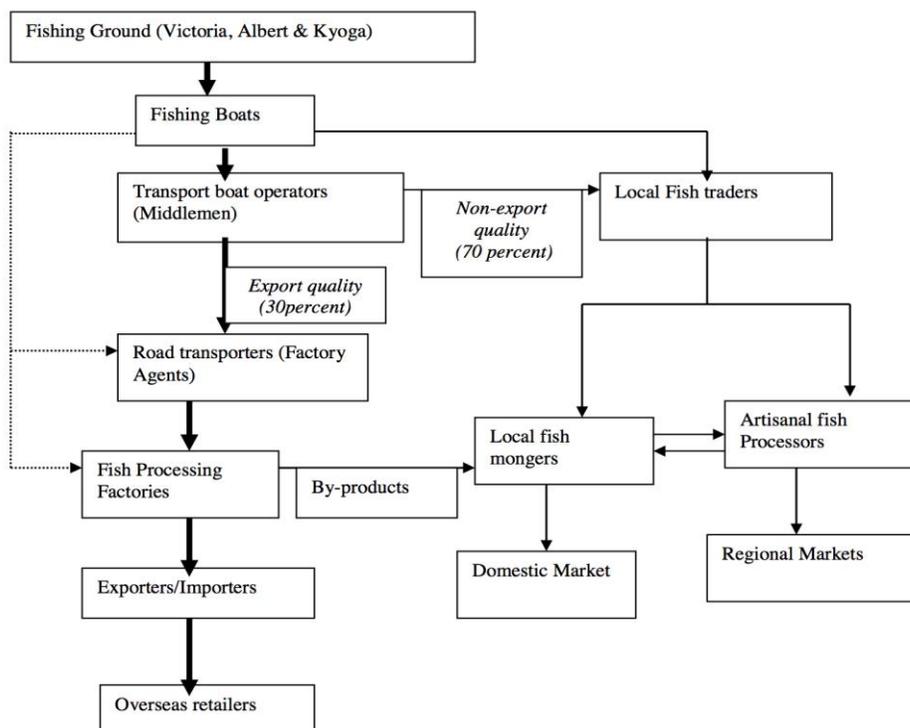
framework to regulate the sustainability of fish. Now, Uganda is one of the few LDCs allowed to export products from both capture and aquaculture fisheries to the EU. The progress made by the Ugandan fish industry highlights the importance of a government-industry partnership in meeting the quality and sanitary requirements of major importers. Public sector investment in common chemical inspection and cold storage facilities and efforts to educate the community on hygienic handling practices reduced private players' financial burden in overcoming the EU ban. Moreover, the drive to improve the sustainability of Ugandan fisheries, which has included efforts to map the major breeding grounds of species in Lake Victoria and increased regulation of harmful fishing equipment, seems to have arrested the decline production and exports (DFR 2011; Fish Site 2013).

Artisanal vs. Industrial Fisheries Value Chain

While the Ugandan fish sector is mostly artisanal, there are some striking differences in the distribution of industrial-grade fish (mostly Nile perch) and that of other species of fish destined for domestic or regional consumption. The distribution of export quality and non-export quality fish diverges after the harvest reaches the landing site, yet the harvesting for all species is left to the artisanal fishers.¹⁰ Export-quality fish is then transported to processing factories after which it is inspected by quality assurance laboratories and either air-freighted from Entebbe International airport or (less often) loaded in temperature-controlled containers and shipped from ports in Kenya (Ponte 2007). On the other hand, the export discards and other fish destined for local consumption - undersized Nile Perch, tilapia and mukene - generally go through a series of traders, agents and artisanal processors operating in landing sites and regional markets. A large amount of fish products are smuggled into Congo DRC, Kenya, South Sudan, and Tanzania.

¹⁰ “The lack of industrial fleets has been reported to be a government strategy to protect the small scale fishing folk whose livelihoods solely depend on these lakes” (Maurice 2011).

Figure 11: Uganda - Typical Fishery Product Distribution Chain



Source: World Bank (2006)

Sustainability Issues

The most serious obstacles to the continued expansion of the Ugandan fish industry are over-exploitation of capture fisheries and increased water pollution in Lake Victoria. As mentioned before, overfishing in the major lakes has resulted in the decline of fish stocks and therefore exports (especially of Nile perch) as the catch per boat has decreased over the last few years. Indeed, rising demand for Nile perch has propelled overfishing in the industry. Processing factories that previously used to accept Nile perch with a minimum weight of 2 kg sometimes now accept fish that weigh only 1 kg because of the fall in supply of the larger ones (Njiru et al. 2009). Moreover, the number of factories that process Nile perch grew from 32 in 2000 to 35 in 2005 despite all operating with excess capacity (Njiru et al. 2009). Increased competition between industrial processors for declining fish stocks has also resulted in the proliferation of bad practices - including the continued capture of immature fish - downstream amongst the artisanal fishers, who employ illegal fishing methods to obtain high catches of Nile perch even

when stocks are declining. Unrestrained use of small gill nets and banned equipment like cast nets allow fishers to capture juvenile and immature Nile perch. Thus, the primary obstacle to establishing sustainable harvesting practices in Uganda is the government's continued endorsement of an 'open-access' approach - no limits on the number of fishers or boats - instead of a 'property rights' approach where the DFR could determine and set quotas for different groups of fishers. In efforts to improve surveillance, however, the government established Beach Management Units (BMUs) in 2003 to encourage local management of sustainable practices at all publicly managed landing sites. A BMU committee comprises local boat owners, crew, fish traders (of which a tenth has to be women) and it is required to regulate the sustainability of harvesting operations like the mesh size used to catch the fish and actual size of the catch itself. Still, the government has faced criticism of BMUs because their introduction does not mitigate the open-access policy and the BMU committees lack the power to actually enforce regulations (Njiru et al 2009).

Opportunities: Regional Trade and Aquaculture

The growing integration between countries in the East African Community (EAC) customs union offers many growth opportunities for stakeholders in Uganda's fisheries industry.¹¹ Lower airfreight costs of shipping to the EU would make for a significant boost to the industrial processing sector. Indeed, relatively high airfreight costs in Uganda are caused by a chronic imbalance: empty planes come in because of low use of airfreight by importers but outgoing cargo planes are relatively full because of the fish exports (World Bank 2013). Furthermore, high airfreight costs in Uganda are partially due to the role played by Jomo Kenyatta International Airport (JKIA) in Nairobi, which has five times the cargo capacity of Entebbe serves as the regional distribution hub for fish trade. Ugandan exporters thus may be able to exploit JKIA as a distribution center with the advent of the EAC.

Increased integration demands harmonization of customs rules and regulations governing shared resources. Currently, however the regulations governing Lake Victoria and its resources currently differ in the three countries - Kenya, Tanzania and Uganda - that share it.

¹¹ The EAC Common Market Protocol was signed and adopted by Burundi, Kenya, Rwanda, Tanzania and Uganda in 2009. It entered into force on 1 July 2010 and established the free movement of labour, capital, goods and services among the member countries.

Monofilament fishing lines, for example, are allowed in Uganda but are banned in the other two (Njiru et al. 2009).¹² There are differing laws on which fish species should be protected - fishing for mukene is prohibited only in Kenya during April to August - and the mesh size limit also differs between the countries (Njiru et al. 2009). Thus, to truly implement sustainable fishing practices and protect the ecosystem of Lake Victoria, Uganda must harmonize its policies with those of Tanzania and Kenya. Joint membership in the EAC will surely open avenues to do just that. Equally important, coordinating customs processes and streamlining cross-border flows as a result of the EAC should also help improve data collection efforts on the size of informal fish trade in Uganda.

In order to counter dwindling capture stocks, the government has also encouraged the growth of aquaculture fisheries. In 2007, the Ministry of Agriculture, Animal Husbandry and Fisheries secured USD 30 million to fund an aquaculture promotion strategy throughout the country to maintain the growth momentum of the aquaculture sector (AllAfrica 2007). Moreover, the Aquaculture Research and Development Centre was established in 2009 - funded by both the Chinese and Ugandan governments - to provide technical training and demonstrations of best practices in breeding and processing for fish farmers (Fish Site 2009a). Most importantly, a Draft Aquaculture Policy was completed in March 2012 and this will provide an effective environmental management framework for the expansion of aquaculture in the next decade or so (Fish Site 2012).

Assessment and Lessons

Uganda has a relatively high ratio of industrial to artisanal fisheries compared to other LDCs (an estimated 20 percent of fisheries are categorized as industrial) (UNEP 2006). Even though it is landlocked, Uganda is a major inland fisheries producer, sharing its main fisheries resource - Lake Victoria - with Kenya and Tanzania. After overcoming safety and quality issues, in 2001 Uganda was granted approval to export fish to the EU. It is not clear that Uganda's ban on unprocessed fish played a major part in the growth of the fisheries sector. Unprocessed or lightly processed fish often commands a price premium over more processed products.

¹² Fish and birds often get entangled in discarded monofilament lines - those made from a single fiber of plastic - and these lines present a choking hazard for fish too.

Moreover, it is usually more prudent to create a favorable environment for investment rather than micro-manage firm decisions.

The main challenges faced by the Ugandan fisheries sector pertain to increasing concerns about the health of fish stocks - exports declined to USD 83 million in 2010 from USD 143 million in 2005 - has prompted authorities to implement reforms in the monitoring and surveillance of fishing practices while encouraging aquaculture to replace capture fisheries (Ponte 2007).

Moving forward, Uganda will only be able to solve the sustainability issue by increased cooperation with its neighbors. Lake Victoria, the most important fish source for Uganda, is a shared resource but there are inconsistent laws governing the regulation of fishing practices in Uganda, Kenya and Tanzania. This nullifies the impact of policy reform by any one government and makes it even harder for the Ugandan government to safeguard its stock of fish. Deepening integration within the EAC should offer opportunities for Uganda to achieve a greater harmonization of regulatory mechanisms with its neighbors while formalizing much of the unrecorded cross-border fish trade in the region.

10. Conclusion

Fishing has great potential to boost growth, employment and food security for a number of LDCs with inland and coastal fish resources. This study provides an overview of the actual and potential role of LDCs in the world fishing market, with case studies of five LDCs: Bangladesh, Cambodia, Comoros, Sierra Leone and Uganda,.

The fishing industry has become increasingly globalized. Non-LDC developing countries have become the largest exporters, with China, Thailand and Vietnam occupying three of the four top spots in the ranking of exporting countries, and developing countries as a group accounting for about two thirds of exports. Moreover, like manufacturing, fishing is increasingly subject to fragmentation of production, with non-LDC developing countries, especially China, importing raw fish and re-exporting after processing. A confluence of factors have contributed to the growth of trade in fresh and processed fish, including: advances in transportation, handling and storage technologies that can manage the perishability of fish; rising demand in developed countries; the need to rebuild depleted fish stocks in developed country waters; the abundance of fish resources in many tropical or sub-tropical regions; and the competitive advantage

provided by low cost labor in this labor-intensive industry. The share of LDCs in world exports is still very low but is growing rapidly and could accelerate with improved management.

Like other industries, fisheries in LDCs are mostly informal and disorganized, and raising productivity is required for international competitiveness. Fishing faces the additional imperative of maintaining resource sustainability (World Bank 2008). Controlling over-fishing is a huge problem for any country and especially daunting for LDC fishery administrations with limited administrative capacities and funding. This document has examined how LDCs have faced this dual challenge of boosting productivity and sustainability.

The five LDCs examined here are quite different in terms of the nature and level of development of their fishing industries. Sierra Leone and Comoros mostly have maritime capture fisheries while Uganda is land-locked but has access to fresh-water fish in Lake Victoria and other lakes, and Bangladesh and Cambodia have both maritime and inland fisheries. All of these countries feature both industrial and artisanal fishing, but the relative significance of the two categories is very different. Bangladesh and Uganda have quite well developed domestic industrial fishing sectors that are certified to export to the European Union. Cambodia has emerged as an exporter to the United States and Japan following reforms since 2000 but is not yet compliant with EU norms. Bangladesh, Cambodia, and Uganda have begun to move into aquaculture production. Domestic fishing in Sierra Leone and Comoros, however, is overwhelmingly artisanal, with industrial fishing carried out by foreign ships. Nevertheless some broad policy recommendations are applicable to all these countries.

Overall Recommendations

Fishing, like other sectors, requires a favorable institutional environment to prosper. Sierra Leone, Uganda, and Cambodia all saw improvements in their fishing industries when civil wars ended. Likewise, improved political stability in Comoros is propitious for upgrading of domestic fishing. Beyond basic political and macroeconomic stability, productivity and competitiveness in exports depend on a developmental state that invests in infrastructure and assists the private sector rather than predated on it (Golub, Bernhardt and Liu 2011). A general principle of industrial policy, applicable to the fishing industry as elsewhere, is that countries should be proactive in assisting the private sector but focus on areas in which they have

comparative advantage (Stiglitz, Lin, Monga and Patel 2013). Governments must accurately assess current capabilities and weaknesses and attempt to provide assistance that will enable progressive upgrading into higher technology sectors. Moreover, governments should focus their attention on providing public goods and leave investment in commercial activities to the private sector. To do otherwise invites costly failures.

Policy must also balance income and employment growth with sustainability of fishing. There is a complex relationship between productivity and sustainability. Under some conditions improving the efficiency of domestic industry can be complementary to sustainable resource use, including 1) increasing capture of fish where stocks are not in danger of over-exploitation, 2) increasing domestic capture at the expense of foreign fishing, and 3) increased value added through reduced losses, improved use of by-catch, and greater local processing and aquaculture. Nevertheless, overfishing is an urgent problem for many LDCs.

Given the common-resource nature of fishing, regulatory oversight is essential. Government fishing agencies must monitor fish stocks, control over-fishing, conduct research, provide technical assistance in quality control, and invest in infrastructure, but typically lack the financial resources and technical expertise to do so. Regional and international cooperation is also crucial in many of these areas, especially monitoring of fish stocks and policing fishing rights. International institutions and non-governmental organizations have an important role to play in many of the areas discussed below. Likewise, enhanced public-private cooperation is conducive to solving problems. Cooperation between various stakeholders and donors played a key part in overcoming the EU bans on fish from Kenya, Uganda, and Tanzania in the late 1990s, as discussed above for Uganda.

For some purposes, policy should differentiate between artisanal and industrial fishing, and for the latter, between domestic and foreign vessels. Improved governance of the sector, however, benefits both small and larger fishing operations.

Infrastructure Provision

Public and private investments in basic and specialized infrastructure are required for the fishery sector to reduce costs and enhance competitiveness. Governments generally must provide basic

infrastructure, leaving development of specialized facilities mostly to the private sector. Transport and electric power infrastructure is sorely lacking in many LDCs. Poor roads increase transport time, pushing up costs. Electricity is even more critical as the cold chain cannot function without reliable power. Government, donors and industrial fishing companies must work together to upgrade fishing-specific infrastructure such as landing sites and the cold chain. The adequacy of landing sites affects the ability to satisfy sanitary norms. Inadequate cold storage facilities constrain exports and processing operations. In Comoros, for example, there are no common refrigeration facilities, one of the reasons for the lack of domestic industrial fishing. The poor quality and high cost of electricity in turn discourages investment in cold storage.

Improving Capacities of Government

In many LDCs, fishing agencies are under-funded, under-staffed, and lack adequate technical knowledge. Donors can assist with funding, institutional design and technical assistance. The designation of revenues received from fishing agreements for enhancing domestic policy agencies is a very positive development. In Comoros, nearly half of the EU financial contributions are earmarked to government capacity building.

Local authorities have to develop the capacity to collect data on the level of fish stocks/production/exports, possibly through partnerships with international organizations, in order to benchmark industry trends for policy purposes. It is not a coincidence that of the countries profiled in the paper, Bangladesh and Uganda are the only two countries for which there are reasonably reliable data on production and exports and that they are the only two that have approval to export to the EU.

Attaining certification for Access to Developed Country Markets

Developed countries have established increasingly stringent public and private standards on imports of produce from developing countries, including fish. The EU standards are the most important and most demanding. The EU requires the establishment of a local Competent Authority to provide oversight of the domestic application of HACCP standards. Only 12

LDCs, including Bangladesh and Uganda, have been able to satisfy the EU norms and thus have access to the European markets. Private standards are even more restrictive so few LDCs are able to sell directly to large global retailers, instead selling to wholesale markets where prices are lower but access is easier.

Close coordination between local government and donors/international organizations as well as between the private and public sector is necessary to satisfy EU norms, as the experiences of Bangladesh and Uganda illustrate. Both of these countries have faced intermittent EU bans, from which they have emerged stronger, with considerable help from donors. While some countries such as Benin have been unable to recover from EU bans (Houssa and Verpoorten 2013), satisfying EU norms can be a stimulus to upgrading. The difference between Bangladesh's and Uganda's relative ease in overcoming and ultimately benefiting from EU bans and Benin's failure to recover fully can be explained by the size of the countries and most importantly, the quality of the countries' institutions combined with the willingness of public and private stakeholders to work together. Moreover, if a country can meet EU standards, it can then also usually satisfy the less stringent requirements in other importing countries, notably those of the US and Japan.

The FAO helped the Bangladeshi government develop inspection schemes, laws and standards governing the capture and conservation of fish in the 1980s. The EU played a similar role during the EU ban on Ugandan fish exports over 1997-2000. Provision of chemical inspection laboratories is a central requisite for ensuring fish quality. In Bangladesh, the government together with external donors invested in laboratory upgrades and employee training to overcome the EU ban on fish exports. Similarly, the Ugandan government along with donors financed inspection laboratories to overcome the EU ban on Ugandan fish exports. Private firms also must do their part in upgrading plant sanitary facilities, training employees and conducting audits of their facilities. International organizations and donors can inform and assist firms about regulations and technologies.

Monitoring and Regulating Domestic Fishing

Both industrial and artisanal fishing contribute to depletion of fish stocks but management of the two has commonalities and differences. In both cases, better knowledge of the state of fish

stocks is the starting point. Monitoring fish stocks and surveillance of fishing require resources and capacities that most LDCs lack. Thus, many LDCs do not have good knowledge of local fish stocks and are unable to prevent illegal fishing. Domestic governments can oversee fishing close to the landing sites, but are generally unable to monitor foreign ships operating offshore. Global assistance, particularly from the EU, can play an essential role for maritime fishing and regional cooperation can be critical for inland fishing.

Control of industrial fishing requires assertion of the government's sovereignty over a country's fishing waters, as Namibia has done successfully (OECD 2012). Prior to independence in 1990, fishing by foreign vessels in Namibian waters under agreements with other countries was poorly monitored and likely often illegal. The main fish stocks, notably hake, were depleted and fishing yields dropped dramatically. The government implemented a Namibianization policy with a focus on rebuilding fish stocks. Quotas were established and carefully monitored and controlled by the government. The Namibian authorities prioritized development of a regulatory framework, human resource development and dialogue with stakeholders.

Controlling artisanal fishing is more difficult both politically and socially, given the sector's role in survival employment and income. Most LDC governments have legislation protecting against industrial trawling activity but laws regulating fishing practices and equipment for artisanal fisheries are also required.

Regional agreements are important for common resources, e.g. Nile perch in Lake Victoria, which Uganda, Kenya and Tanzania share. Obtaining information and formalizing often large unrecorded cross-border trade in fish products is also a task for regional collaboration.

Most attempts to control overfishing in LDCs have had little success, either because they were not fully implemented or failed. For example, Cambodia's assigning of private property rights through a commercial lot system worsened the situation. Bangladesh, Uganda and Cambodia have recently initiated projects that involve the formation of local fishing communities as a means towards controlling over-fishing: village surveillance communities in Bangladesh, Beach Management Units (BMUs) in Uganda, and 'co-management communes' in Cambodia. The goal is to inform the fishing community and local leaders about harmful practices and then to authorize the local community itself to monitor the fishing practices of its members.

Transitioning from Artisanal to Industrial Fishing

Transitioning from artisanal to industrial fishing requires accumulation of human and physical capital. In LDCs with fishing traditions, such as Cambodia, Comoros and Sierra Leone, there are numerous skilled artisanal fishers, but little knowledge of modern fishing and processing technology. In Comoros, traditional fishing using wood canoes has evolved into artisanal fishing using small-motorized fiberglass boats. Increasing the number and size of motorized boats can boost both productivity and sustainability by enabling ships to go further offshore, where fishing stocks are less threatened but requires investment in building the boats and skilled personnel to operate them.

Investment in boats, landing facilities and processing factories by domestic entrepreneurs depends on availability of credit. Yet financial systems in LDCs are generally very shallow, and banks are averse to lending to small artisanal businesses. Artisanal fishermen obtain the lowest margins amongst all stakeholders in the typical distribution chain in LDCs, so their ability to repay loans is understandably a source of concern. Development of appropriate credit facilities along with mechanisms that ensure repayment of credits is a central problem confronting LDC economic policymakers. Adequately funded and staffed fishing schools, along with technical assistance from donors, can raise skills.

Moving Up the Value Chain: Processing and Aquaculture

LDCs do very little processing. Bangladesh and Uganda are partial exceptions. Uganda banned the export of unprocessed fish to spur domestic processing, but such measures are unlikely to suffice to attract investment in higher value-added activities such as canning, and could be counterproductive if it dissuades exports. For canning and freezing, non-LDC developing countries have the advantage of economies of scale and better know-how and logistics. As LDCs improve their business climates and transition towards industrial fishing, foreign and domestic investment is likely to respond.

Aquaculture, like capture fisheries, can be either small and artisanal or industrial. Industrial aquaculture is beyond the reach of most LDCs. Some LDCs, however, including Bangladesh, have been successful in boosting small-scale aquaculture to aid income and food security in

rural communities. Industrial-scale aquaculture likely requires foreign participation given the capital and organization involved.

Growth in aquaculture can be facilitated by investment in research institutes as Bangladesh and Uganda have done. Bangladesh is now the 5th largest aquaculture producer in the world. The Bangladesh Fisheries Resource Institute (BFRI) has successfully developed and disseminated genetically modified strains of fish to suit the local ecology while simultaneously training small-scale farmers on best practices. The Ugandan government has recently established an aquaculture research institute in a joint-venture partnership with China and efforts are underway to replicate a model similar to that of the BFRI.

Selling Fishing Rights to Foreign Countries

A number of LDCs receive foreign exchange earnings by leasing out maritime fishing rights, notably to the EU and Japan. The advantages to LDCs include fees and technical assistance in exchange for fishing rights. The drawbacks are that the fish are often not processed locally and monitoring of compliance on fishing limits is difficult. Agreements with foreign fleets should be carefully negotiated to ensure that the home country receives adequate benefits. The EU agreement with Comoros seems to be fair to both parties, with Comoros receiving revenues of more than 10 percent the value of the fishing rights, along with substantial technical assistance and help in monitoring fishing stocks. Not all fishing agreements are as transparent as the EU's however. In Sierra Leone, for example, the operations of Chinese and Korean fleets are putting pressure on fish stocks in waters demarcated for artisanal fishers, while export earnings from license agreements are low relative the actual export incomes earned by these enterprises. Effective regulation of foreign vessels and transparency of agreements is indispensable to the sustainable development of the sector. Accords should also provide incentives for local landing and processing, where economically efficient to do so.

Priority Actions

The following actions are recommended as the highest priorities in order to attainment certification to export to developed countries and boost income and employment in fishing in LDCs. A general theme is the need for the various stakeholders to work together.

1. Institutional capacity building. LDCs should seek help from development partners to develop governments' capacity to monitor and regulate its fishing sectors
2. Infrastructure provision.
 - a. Electricity. The fishing sector, like many others, cannot function without reliable electric power. It is incumbent upon governments to resolve the problem of power outages and excessively costly electricity.
 - b. Cold storage. Public-private-donor joint investments should target the cold chain, which is crucial due to the perishability of fish.
 - c. Chemical inspection laboratories. Creation of laboratories for testing fish was a key step in obtaining EU certification in both Bangladesh and Uganda.
3. Regional cooperation. Several countries usually share fishing stocks, whether the waters are maritime or inland. Monitoring, control and surveillance must be coordinated, as Kenya, Tanzania and Uganda are doing increasingly successfully. Regional organizations such as the Indian Ocean Tuna Commission (IOTC) can play a catalytic role.
4. Community-based approaches to fishing conservation, such as Uganda's Beach Management Units should be explored further. These organizations are best placed to balance the use of fisheries as a source of employment against the need to protect fish stocks.
5. Fishing agreements. Donors, NGOs and LDC governments should ensure that fishing agreements with developed country fishing fleets are transparent, include fair fishing fees, and provisions for capacity building for local governments and fishers.

References

- Arjumanara L, Alam MF, Rahman MM, Jabbar MA (2004) Yield gaps, production losses and technical efficiency of selected groups of fish farmers in Bangladesh. *Indian Journal of Agricultural Economics* 59 (4): 808–818.
- AICP-CEP. 2013. *Finfish Study 2013*. Rep. Brussels: AIPCE-CEP, December.
- Akande, Rasaaq G., A.O Olusola, R.S. Adeyemi, M.M. Salaudeen, and A.O. Abraham-Olukayode. 2012. "Proximate composition and levels of polycyclic aromatic hydrocarbons (PAHs) in catfish (*Clarias gariepinus*) using different smoking systems" Third Workshop On Fish Technology, Utilization And Quality Assurance In Africa. FAO: 129-136.
- Alam, Md F., and Madan M. Dey. 2011. FAO: A Background Paper on Bangladesh Fisheries.
- AllAfrica. 2007. "Uganda: Fish Farming Will Not End Shortage." 29 Oct. 2007. Web. <http://allafrica.com/stories/200710292109.html>
- Anders, Sven M. and Julie A. Caswell (2009). "Standards as Barriers Versus Standards as Catalysts: Assessing the Impact of HACCP Implementation on US Seafood Imports," *American Journal of Agricultural Economics* 91(2): 310-321.
- Asian Development Bank (ADB). 2005. *The Tonle Sap Basin Strategy*.
- Bangladesh Bureau of Statistics (BBS). 2010. *Statistical Yearbook: Chapter on Livestock, Forestry and Fisheries*.
- Belloc, Marianna, and Michele Di Maio. 2012. Sierra Leone's National Export Strategy: Implementation Issues and Recommendations. Working paper, 11/1018: International Growth Centre.
- Belton, Ben, Manjurul Karim, Shakuntala Thilsted, and Khondker Murshed-e-Jahan. 2011. Review of Aquaculture and Fish Consumption in Bangladesh. *Studies and Reviews* 2011-53. The WorldFish Center.
- Béné, Christophe, Bjørn Hersoug, Edward H. Allison. 2010. "Not by Rent Alone: Analysing the Pro-Poor Functions of Small-Scale Fisheries in Developing Countries, *Development Policy Review* 28(3): 325–358.
- Béné, Christophe 2006. "Small-Scale Fisheries: Assessing Their Contribution to Rural Livelihoods in Developing Countries," FAO Fisheries Circular No. 1008.
- Benjamin, Nancy and Aly Mbaye. 2012. *The Informal Sector in Francophone Africa: Firm Size, Productivity and Institutions*. Washington DC: World Bank.
- BFS. 2010. Sierra Leone Business Fact Sheet. Rep. Netherlands-Africa Business Council.
- Biggs, Tyler. 2012. "Assessing Export Supply Constraints: Methodology, Data, and Measurement." Trade Infrastructure and Economic Development. Ed. Olu Ajakaiye and T. A. Oyejide. Routledge: 49-101.
- Brenton, Paul, Richard Newfarmer and Peter Walkenhorst (2009). "Avenues for Export Diversification: Issues for Low-Income Countries," Commission on Growth and Development *Working Paper* No. 47.

- Cambodia Daily. 2013. "Investor Decries Export Tax on Cambodian Seafood." Phnom Penh: 9 May 2013.
- Cato, James C., and S. Subasinge. 2003. Case Study: The Shrimp Export Industry in Bangladesh. International Food Policy Research Institute (IFPRI) 10(9).
- Collier, Paul. 2008. "Growth Strategies for Africa," Commission on Growth and Development *Working Paper* No. 9.
- Department of Fisheries Resources (DFR) Annual Report 2010/11. 2011. Ministry of Agriculture, Animal Industry and Fisheries (Uganda).
- Dey, Madan M., Md F. Alam, and Manik L. Bose. 2010. "Demand for Aquaculture Development: Perspectives from Bangladesh for Improved Planning." *Reviews in Aquaculture*: 16-32.
- Doherty, Martin (2010). "The Importance of Sanitary and Phytosanitary Measures to Fisheries Negotiations in Economic Partnership Agreements," International Centre for Trade and Sustainable Development Issue Paper No. 7.
- Edwards, Peter, and Sazzad M. Hossain. 2010. "Bangladesh Seeks Export Markets For Striped Catfish." *Global Aquaculture Advocate* May/June 2010: 61-62.
- EEAS. "Sierra Leone - Fisheries." European External Action Service. European Commission. Accessed at http://eeas.europa.eu/delegations/sierra_leone/eu_sierra_leone/tech_financial_cooperation/rural_development/fisheries/index_en.htm.
- European Union. 2013. *Evaluation Retrospective et Prospective du Protocol de l'Accord de Partenariat dans le Secteur de la Peche entre l'Union Europeene et l'Union des Comoros*, Final Report.
- FAO Fishery *Statistical Collections* Database. Web. Accessed at <http://www.fao.org/fishery/statistics/global-commodities-production/en>
- FAO Fishery *Statistical Collections* Database. Web. Accessed at <http://www.fao.org/fishery/statistics/global-commodities-production/en>
- FAO. 2005. Causes of Detentions and Rejections in International Fish Trade. FAO Technical Paper. Rome.
- FAO. 2011a. Private Standards and Certification in Fisheries and Aquaculture. FAO Technical Paper. Rome.
- FAO. 2011b. National Fishery Sector Overview - Cambodia: Fishery and Aquaculture Profiles.
- FAO. 2012a. Fishery and Aquaculture Statistics Yearbook. FAO Yearbook, Ed: 2010. Rome
- FAO. 2012b. The State of World Fisheries and Aquaculture. Ed: 2012. Rome.
- Fox, Louise, Cleary Haines, Jorge H. Muñoz and Alun Thomas. 2013 "Africa's Got Work to Do: Employment Prospects in the New Century," *IMF Working Paper* 13/201.
- Gagern, Antonius, and Jeroen Van Den Bergh. 2010. "A Critical Review of Fishing Agreements with Tropical Developing Countries." *Marine Policy* 38 (Mar 2010): 375-86.

- Golub, Stephen S. and Jeffrey McManus. 2009. "Horticulture Exports and African Development," paper prepared for UNCTAD.
- Golub, Stephen S., Arielle Bernhardt, and Michelle Liu. 2011. "Development and Trade Strategies for Least Developed Countries," paper prepared for UNCTAD, March.
- Golub, Stephen S., Ronald Jones and Henryk Kierzkowski. 2007, "Globalization and Country-Specific Service Links," *Journal of Economic Policy Reform*, 10(2): 63-88.
- Houssa, Romain and Marijke Verpoorten. 2013. "The Unintended Consequences of an Export Ban: Benin's Shrimp Sector," University of Namur Working Paper 1304.
- Hussain, M. G. 2010. "Freshwater Fish of Bangladesh: Fisheries, Biodiversity and Habitat." *Aquatic Ecosystem Health & Management* 13(1): 85-93.
- Hussain, M. G., and Md E. Hoq, eds. 2010. Sustainable Management of Fisheries Resources of the Bay of Bengal. Bangladesh Fisheries Research Institute (BFRI).
- Integrated Framework. 2007. *Comoros Diagnostic Trade Integration Study* (DTIS).
- International Monetary Fund. 2010. "Union of the Comoros: Action Plan for Implementation of the 2010-2014 Poverty Reduction and Growth Strategy," *IMF Country Report* No. 10/191.
- Josupeit, Helga. 2011. "Challenges to Sub-Saharan African Fish Exports." Third Workshop On Fish Technology, Utilization And Quality Assurance In Africa. FAO, 2011. 157-70.
- Laffaire, Chloe. 2009. "La Filiere Peche aux Comoros," International Fund for Agricultural Development (IFAD).
- Lord, Montague, Rina Oktaviani, and Edzard Ruehe. 2010. Indonesia's Trade Access To The European Union: Opportunities And Challenges: Annex.
- Masette, Margaret. 2011. "Sun-Dried Mukene (*Rastrinebola argentea*) Value-Chain Analysis in Uganda." Third Workshop on Fish Technology, Utilization and Quality Assurance in Africa. FAO, 2011. 179-190.
- Maurice, Ssebisubi. 2011. Analysis of Small-Scale Fisheries' Value Chains in Uganda: FAO.
- Mbekeani, Kennedy K. 2012. "The Role of Infrastructure in Determining Export Competitiveness." Trade Infrastructure and Economic Development. Ed. Olu Ajakaiye and T. A. Oyejide. Routledge: 139-169.
- Mensher, Ian J. 2006. "The Tonle Sap: Reconsideration of the Laws Governing Cambodia's Most Important Fishery." *Pacific Rim Law & Policy Journal* 15.3: 797-825. Web.
- NaFFIRI. 2012. National Fisheries Resources Research Institute (Uganda): Annual Report 2011/12.
- Nam, So, and Touch Bunthang. 2011. *Fisheries Resources in Cambodia: Implications for Food Security, Human Nutrition and Conservation*. Proc. of "Feeding Asia in the 21st Century: Building Urban - Rural Alliances", Grand Copthorne Hotel, Singapore.
- Nam, So. 2008. *Fisheries Resources in Cambodia - Current Status, Key Issues, Directions*. Nicodème Nimenya, Pascal-Firmin Ndimira and Bruno Henry de Frahan (2012). "Tariff

- equivalents of nontariff measures: the case of European horticultural and fish imports from African countries” *Agricultural Economics* 43: 635-653.
- Njiru, M., A. Getabu, A. M. Taabu, E. Mlaponi, L. Muhoozi, and O. C. Mkumbo. 2009. "Managing Nile Perch Using Slot Size: Is It Possible?" *African Journal of Tropical Hydrobiology and Fisheries* 12: 9-14.
- OECD. 2012. *Rebuilding Fisheries in Developing Countries* (Paris).
- Okello, Julius Juma (2011). “The Role of Collective Action in Overcoming the Challenges of European Food Safety Standards: The Case of Kenya’s French Bean and Nile Perch Industries,” *Agricultural Science Research Journal* 1(1): 30-37.
- Ponte, Stefano. 2007. "Bans, Tests, and Alchemy: Food Safety Regulation and the Uganda Fish Export Industry." *Agriculture and Human Values* 24 (2007): 179-93.
- Rab, Mohammed A., Hap Navy, Seng Leang, Mahfuzuddin Ahmed, and Katherine Viner. 2004. *Marketing Infrastructure, Distribution Channels and Trade Pattern of Inland Fisheries Resources Cambodia: An Exploratory Study*. Working paper. WorldFish Center.
- Sothorn, Kem, Chhim Chhun, Theng Vuthy, and So Sovannarith. 2011. *Policy Coherence in Agricultural and Rural Development*. Working paper. Phnom Penh: CDRI.
- Sperber, William H. and Richard F. Stier (2010). “Happy 50th Birthday to HACCP: Retrospective and Prospective,” *Food Safety Magazine*, December 2009/January 2010.
- Stiglitz, Joseph, Justin Lin, Célestin Monga, Ebrahim Patel. 2013. “Industrial Policy in the African Context,” World Bank Policy Research Paper 6633.
- Straits Times. 2013. "Fish Numbers in Yangtze on 'edge of collapse'" Straits Times [Singapore] 17 Aug. 2013.
- The Cambodia Daily. 2013. "Investor Decries Export Tax on Cambodian Seafood." 9 May 2013.
- The Fish Site. 2008. “Uganda’s Declining Fish Stocks Spell Disaster.” 29 Jul. 2008.
- The Fish Site. 2009a. “China-Uganda Aquaculture Project Launched.” 07 Oct. 2009.
- The Fish Site. 2009b. “Uganda Seeks to Boost Fish Output Again.” 23 Sept. 2009.
- The Fish Site. 2012. “New Draft Aquaculture Policy Completed.” 19 Mar. 2012.
- The Fish Site. 2013. "Calls for a Privately Run Aquaculture Sector." 13 Sept. 2013.
- The Phnom Penh Post. 2012. “Fish exports fall in plan to increase production.” 4 Jan. 2012. Web. <<http://www.phnompenhpost.com/business/fish-exports-fall-plan-increase-production>>
- UN COMTRADE Database. Available at <http://comtrade.un.org/db/>.
- UNCTAD (2008), “Export Competitiveness and Development in LDCs: Policies, Issues, and Priorities for Least Developed Countries”.
- UNCTAD. 2005. “Promoting Participation of developing countries in dynamic and new sectors of world trade: fishery products”, *Expert Meeting on Dynamic and New Sectors of World Trade*, Geneva, October 24-26, 2005, Item 3 of the provisional agenda.

- Undercurrent News*. 2013. "IUU Fishing in Sierra Leone Declining." 11 Apr. 2013. Accessed at <http://www.undercurrentnews.com/2013/04/11/iuu-fishing-in-sierra-leone-declining/>
- United Nations Environment Programme (UNEP). 2006. Uganda: Integrated Assessment of Uganda's National Trade and Fisheries Policies.
- Van Der Meer, Kees, and Laura L. Ignacio. 2007. *SPS Balance Sheet for Cambodia*. Standards and Trade Development Facility.
- World Bank. 2006a. Uganda - Diagnostic Trade Integration Study (DTIS) Volume 1: prepared for the enhanced integrated framework. Washington DC: World Bank.
- World Bank. 2006b. Uganda - Diagnostic Trade Integration Study (DTIS) Volume 2: prepared for the enhanced integrated framework. Washington DC: World Bank.
- World Bank. 2006c. Sierra Leone - Diagnostic Trade Integration Study (DTIS): prepared for the enhanced integrated framework. Washington DC: World Bank.
- World Bank 2008. *The Sunken Billions*. Washington DC: World Bank
- World Bank 2010. The Hidden Harvests: The Global Contribution of Capture Fisheries, Conference Edition.
- World Bank. 2012. "Comoros Economic Reform Development Policy Grant Program" Report Number 72392.
- World Bank. 2013. World Databank, World Development Indicators Database. Accessed at <<http://databank.worldbank.org/data/views/reports/tableview.aspx>>
- World Bank. 2013. Uganda - Diagnostic Trade Integration Study (DTIS) update: prepared for the enhanced integrated framework. Washington DC: World Bank.
- WorldFish 2011. Fish Supply and Demand Scenarios in Cambodia and Perspectives on the Future Role of Aquaculture. Issue brief. 2011-23, May 2011.
- WorldFish 2013. Building Resilient Community Fisheries in Cambodia.
- Xinhua. 2012. "Cambodia Fish Exports Earning up despite Output Decline in 2011." Xinhua. 3 Jan. 2012. Web. <http://news.xinhuanet.com/english/business/2012-01/03/c_131340598.htm>.
- Xinhua 2013. "EU's fish import ban not harming Cambodia's export: official." Xinhua. 27 Nov. 2013. Web. <http://news.xinhuanet.com/english/business/2013-11/27/c_132922402.htm>.