

*Full Length Research Paper*

# The fish industry in Eritrea: from comparative to competitive advantage

Teweldemedhin, M. Y

<sup>1</sup>Department of agriculture, Polytechnic of Namibia, Namibia. E-mail: tmogos@polytechnic.edu.na. Tel: +264 61 207 2030; fax +264 61 207 2143

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The paper examines the main constrains in stimulating extent of production driven supply chains, that could able to transform into market driven supply chain management.; Questionnaires, were developed and administered to marketing agents using purposive sampling, with the application of Porter's diamond of national competitive advantage. Red sea being underexploited resource; and it is unique opportunity for the development of the country (MOF, 1997). However, this comparative advantage has never been converted to competitive advantage. Comparing to the percentage of fish population with in 100km from the coastal, Eritrea has the larger fish resource concentration in the region (73%). However, the sector has never made significant contribution to the country food security. The study confirms that all the role payers in the fish market chain and policy makers need to take a strategic approach, in identifying target markets, and ways to build strong and sustainable production. Moreover, all stack holder in the sector needs to formulate how to move up to: the value chain; niche marketing opportunity; converting comparative into competitive advantage; specifically focus on the services revolution; and overcoming technical and structural barriers.

**Key words:** supply chain management, comparative advantage, competitiveness and porter analysis.

## INTRODUCTION

Eritrea borders on the Red Sea with its rich and diverse marine life, more than 1000 known species of fish and 220 species of coral all of them commercially valuable (Ministry of Fishery (MOF), 1997)

However, the fishery sector in Eritrea is not able to use this unique and comparatively rich opportunity to optimize the fish catch to the Maximum Sustainable Yield (MSY) level (MOF, 1997). An optimum catch level is said to represent MSY, whenever it reaches the growth rate of the source population; hence the maximum sustainable yield is related to maximum growth, and represents the largest catch that can be sustained (Tom, 2000).

Even though, the Eritrean Sea is rich marine resource, MSY of Eritrea fluctuates between 36,000 and 79,500 tons per year (MOF, 1997). The current level of production ranges between 4000 and 6000 tons. This is less than the average of 6800tons which was registered in the 1950s, 1960s, and early 1970s (Food Aid Organization (FAO), 2000). Poor distribution system, lack of infrastructure facilities and service negatively affect productivity, irregular and unreliable transport links pose distributional constraints to fisheries commercialisation (FAO, 2000).

Generally, fishing operation in Eritrea has done into two ways that is Artisanal fishing and Industrial fishing (Reynolds et al., 1993). Artisanal fishery sector is characterized by the use of simple fishing technology, low level productivity, and a socially and geographically constrained system of distribution (Scovazzi, 1992), whereas industrial fishery uses advanced and improved fishing technology. This includes modern/advanced fishing gear and fishing craft (FAO, 1997) The whole industry, however, is constrained by several political and socio-economic factors. Since investigating all constrains is too broad with focus of Porter's determinants. This study will focus: mainly on factor (supply) conditions, demand conditions, supporting industries and government support.

## OBJECTIVE AND METHODOLOGY

The study aims at identifying the market supply chain distribution and its bottlenecks in the Eritrean fishery sector. Questionnaires, which made use of Porter's determinants of competitive advantage, were developed and administered to marketing agents involved in the chain. This made it possible to follow the marketing process from origin to final destination.

Using purposive sampling, 150 questionnaires were distributed to head office staff members of the Ministry of Local government, the Ministry of Finance and the Foreign affairs at capital city of Asmara. Since these ministries are located in one site, and are most likely to represent the local population. The questionnaire was pretested on some fish consumers and university lecturers. They all remarked that the questionnaire was comprehensive and easy to understand. Then visits were made to 21 city restaurants. More-over, an interview has been conducted with fishermen and role players in the channel at Massaw and Asseb; 111 questionnaires were received back; and nine of them were incomplete and excluded from the analysis. \*Respondents are chosen for a particular purpose on the basis that they are "typical" of a group or represent diverse perspectives on an issue (Leedy and Armrod, 2000)

### Literature review

The large number of studies that have looked at the management of fish and the fish supply chain distribution process has resulted in/lead to an enormous general supply chain literature Handfield and Nichols (1996) and Poirier (1999) principally focus on managing the logistics of the process of the fish industry. In support of this idea, Amin (1999) indicated that the availability of an efficient and well-balanced marketing channel structure decreases marketing cost. Therefore, a well-functional channel structure is a necessary condition for success of marketing surplus.

The concept of applied study Hahn and Ribeir (1999) and van der Voorst et al. (2000), conceptualized the distribution process as a chain. The interdependence of the constituent parts (or links) is implicitly recognized. Therefore, no participant in the chain is isolated, and livelihoods of fisheries are affected by the actions of others within the chain as much (if not more so) than by individual's actions. Consequently, as trading relationships grow and supply chains are progressively fine-tuned, effective governance mechanisms are evermore important to ensure that profits/returns are maximized at the chain level from supplying quality products (Voorst et al, 2000).

Moreover, particularly within the food sector, ethical and health concerns are demanding new (quality conscious) governance mechanisms, as result producers required to bind with certain safety measures (Lupin, 1999). For example, the 1998 EU Hazard Analysis and Critical Control Point (HACCP) embargo had create severe macroeconomic repercussions for Kenya, Tanzania and Uganda, repercussions that reverberated back down the chain to devastate the livelihoods of both fisher folk and ancillary workers in the local lakeside communities (Lupin, 1999).

Wessells (2002) says that the seafood market is always pressurized to ensure desired attributes of health and quality standards to be competitive. According to Porter (1990), competitiveness is a result of a number of interactions. It can be grouped in to two categories: the cost of production and the quality (perceived quality) of the product. As suggested by Collins (1999), Supply Chain Management (SCM) principles may provide guidance to enhance the performance of the fish industry.

When and why is an industry competitive (both at domestic and internal market)? How sustainable can a competitive position be? According to Porter (1990), the answer lies in six broad criteria or attributes that shape the environment in which firms compete and promote the creation of competitive advantage. These are: factor (supply) conditions, demand conditions, supporting industries, firm strategy, government policy, and role of chance.

As indicated in the formulation of the aim, this study will examine the main catalyst in stimulating the extent of production-driven supply chains management that could transform into market-driven supply chains management with in Porter's diamond of national competitive advantage.

## DISCUSSIONS AND RESULTS

This section discusses the role players in the fish supply market channel, the characteristics of domestic fish market in Eritrea, the comparative advantage of Eritrea, and the role of government.

### Role players in the market supply chain

The supply chain comprises the marketing channel ranging from the producer distribution to consumers.

### Fish marketing channel

According to MOF (2001), there are three well-known marketing channels are operating in the Eritrea. The first channel is the fisherman →domestic suppliers' →retailer →consumer channel. The second marketing channel comprises fisherman →wholesaler →retailer → consumer. The third channels involve direct sales by fisherman to retailers then consumers.

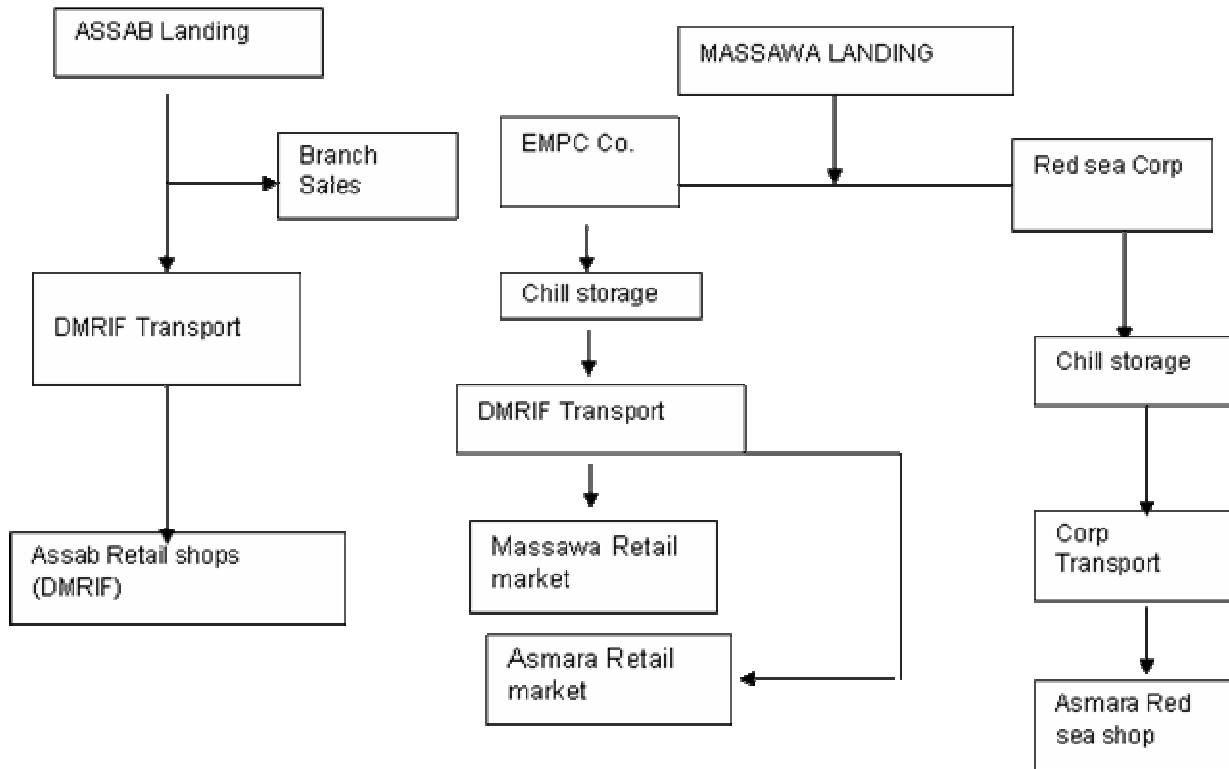
Figure 1 shows that the formal fish channel is based in two receiving centers. From the Assab landing center fish goes directly to the Department of Marine Resources and Inland Fisheries (DMRIF) branch sellers. From Massawa landing center fresh fish distributions, involving by the two biggest companies: the Eritrean Marine Product Company (EMPC) and Red Sea Corporation; of the two the EMPC is the biggest supplier; and has its own retailer shops in Massawa and Asmara. The Red Sea Corporation is a limited private company, supplying only about 10% of the total to Asmara outlet (MOF, 2001)

As depicted in the Figure the fresh fish market indicating it seems well structure. However, this channel able to accommodate few productions in the system. Moreover, EMPC receives and handle the fresh fish supply with preliminary quality and safety measures on its receiving center, then the complete quality test done in Asmara for the export purpose. EMPC supplies more than 70% of the production (MOF, 2001). This shows the company monopolized the sector. Most of the fish production and marketing in Eritrea is conducted in an unorganised manner (FAO, 2001). That resulted to high transportation cost and high rate of spoilage (MOF, 2001).

### Fish distribution and Supplies

A substantial quantity of expensive species, especially dried shark (meat and fins), mullets and jacks find their way through long established trading channels across to the Red Sea to Saudi Arabia and Yemen. According the informal interviews at fishing camps at Massawa, these countries also are major sources of the fishing inputs and other supplies (MOF, 2001).

The primary and main bottleneck of fishermen to increase the distributional capability of the product is constrained by the lack of ice supply from the centers. Ice is



**Figure 1.** Fresh fish distribution chain (late 2000)

only available at Massawa with a limited supply (FAO, 2000). Even the existing plant, operates with antiquated equipment and with a capacity severely restricted because of the extensive damage incurred during the war. Especially Assab ice supplying facilities has been no production since 1998 (MOF, 2001). Moreover, according to interview that have been done at the Massawa fish receiving center, most of fishermen indicated that during the winter fishing season, certain fishing center's deliberately kept their receiving potential at minimum level because of marketing and facilities difficulties.

Moreover, results from a consumer's survey in Asmara show that price intervention is ineffective for the lower class income society without simultaneous efforts to promote fish consumption. It is also important to compare fish to other animal proteins and eating habits of the society (FAO, 2000).

### Characteristics of domestic market in Eritrea

#### Price of Fish

The policy of the government is to keep fish price affordable and accessible to consumers. Accordingly prices are controlled by Department of Marine Resources and Inland Fisheries (DMRIF) particularly at the two major landing sites of Massawa and Assab (MOF, 1997) Regulated ex-vessel prices for 1992 of Grades I, II and III varied in between Nakfa (NKF) 2.00/kg – 3.00/kg, NKF

1.75/kg – 2.00/kg and NKF 1.35 – 1.5/kg respectively. At the beginning of December 1993 producer and retail prices were both adjusted; and producers received NKF 3.75/kg for Grade I and 3.25/kg for Grade II (Grade III was combined to Grade II). (Table 1)

Currently the selling price of fish for Grade-I is at about 25 NKF per Kg; however, 18% of the consumers from the sample said that it is very expensive, and 54.5% said it is expensive (Table 2). The reason that was given: Since it is our natural resource, it should be cheaper; the cost compared to the net weight of the edible part is too expensive.

Moreover, 20% of the respondent said, comparing its nutritive value with other related commodities, it is fair and 1% accounted for no idea on the question.

#### Supply of Fish

After the customer survey, visits were made to 21 Asmara restaurants known to be routine or occasional buyers of fish. It was found that the inclusion of fish on City restaurant menus is a well-established tradition. About half of the restaurant serves fish every day, and the rest serve for at least three times in a week. When queried made about how often you would like to serve fish, almost all owners/ managers said "daily". There is also special demand on Wednesdays and Fridays, due to traditional fast (non-meat) days of the Orthodox Church. However, due to shortage of supply the restaurants and

**Table 1.** Changes in regulated price for fish, 2000.

Price setting effective	Producers price		Massawa consumer price		Asmara consumer price	
	Grade I	Grade II	Grade I	Grade II	Grade I	Grade II
Jan. '2000	14.00	12.00	20.00	18.00	22.00	20.00
June '2000	16.00	14.00	22.50	20.00	24.00	20.00
Oct. '2000	16.00	14.00	22.60	20.85	24.60	20.85
Dec. '2000	18.75	16.25	24.25	20.75	25.00	21.00

Source MOF, 2000.

**Table 2.** Consumers' responses for the price of fish (in percentage)

Scale	Very expensive	Expensive	Fair	Less	Total
Price	17.83	54.5	19.80	7	99

Source own research data

**Table 3.** Summary of fish use, accessibility, and supply

Description	Percentage	
	Yes	No
Do you use fish in your diet?	79	21
Do you have easy access to market	30	70
Do you think there is enough supply of fish on the market?	38	62

Source: own research data

retail shops couldn't react to this special demand. Most of the restaurant owners/managers indicated that shortage of fish is their major concern.

### Price of related commodity

According the survey, the price of meat is 40 NKF per kg. This shows that fish is much cheaper than meat, given. The preference, income; accessibility and ease of cooking remain constant. However, 21% of the respondents never use fish at all (Table 3). Among the factors that affect the demand of fish were: preference (taste), ease of cooking, accessibility, and level of income.

As sited on Family Health International (2006), fish has excellent nutritional value, providing high quality protein and a wide variety of vitamins and minerals. However, in most developing countries favourably complements dietary protein provided by cereals and legumes that is much affordable. Experts agree that, even in small quantities, fish can have a significant impact in improving the quality of dietary protein by complementing the essential fossil and amino acids that are often present in low quantities in vegetable based diets. Though, fish is rich in content and affordable to consumers relative to other protein item. In general, people are much more dependent on other alternative proteins as part of their food

diets in Eritrea (Negash, 2003).

### Accessibility

Accessibility is among the main problem for the fish consumers in Eritrea; for example in the capital city (Asmara), most of the retail shops are located at the center of the city called "Marikato".

Table 3 shows that 70 percent of respondent; they do not have easy access to the market. As a result 21% of the respondent said that they do not use fish in their diet at all.

As indicated from Table 4 families from middle income group (1200 to 2000) buys fish more frequent than the other income group. From this 8% uses at least once a week, 7% twice, 4% once in a month and 13% buys occasionally (Table 4).

### Main constraints to fish Exporters

Muir (2001) on his report shows that, the critical problem and bottleneck for Eritrean fish sector is shortage of preserving materials (such as: ice, plastic container, chillers, and blast freezers); whereas, competitor's countries (such as Senegal, Oman, and India) use domestically produced plastic and foam box preserving. As a result,

**Table 4.** Percentage of fish demand by income

Family income	Demand for fish	Once a week	Once in two week	Once in a month	Occasional
>200	1			1	
201 - 500	3		1		2
501 - 1200	25	5	4	9	7
1201 - 2000	32	8	7	4	13
Over 2000	18	4	3	7	4
Total	79	17	15	21	26

Source: own research data

**Table 5.** Red sea sharing countries production level (regional comparison) in 2000.

Countries	Production in thousands (tons)	Per cap food supply fish & fish prod. (kg/person)	% pop. with in 100km of the coast
Egypt	507.88	13	53.00%
Yemen	124.5	6	63.00%
Saudi Arabia	64.6	7	30.00%
Eritrea	13	2	73.00%
Sudan	7	2	3.00%

Source: world resources institute, 2006

enjoy a relatively low cost of processing.

Moreover, with the introduction of EU-HACCP standards and requirement in 1998 exert pressure to comply the sector with the standards and safety measures, however, the traditional fishermen were unable to comply with this requirement, due to shortage of necessary preserving material after and before landing their product. Consequently the coastal fishing villagers prefer to smuggle illegally to Yemen or coastal villages regardless of the quality (MOF, 2002). This problem restricted the production supply in the country.

Lack of effective means of transportation is another problem; as Yemane (2003), manager of EMPC, indicated on his interview that Eritrea fish product is not well connected to the outside world. There is no regular shipping from the port of Massawa or Assab, as alternative exporters use airplane which very expensive and irregular airplane landing. Hence, the sector incurred a weight loss from the flight delays.

Moreover, the government to stimuli export growth, the Ministry of Fishery, has signed around 40 contractual agreements with foreign investors (MOF, 2002). However, few of them were implemented, due to: unstable political satiation of the country, poor communication and information facilities (Negash, 2003).

### Comparative advantage and International comparison

#### Comparative advantage

Table 5 shows that the productivity of the red sea sharing

countries (regional comparison) of fish and fish product in 2000. Egypt is the leading producer in the Middle East (and the third largest producer in Africa), that accounted for about 507 thousand tons, followed by Yemen at about 124 thousand tons; Saudi-Arabia accounted for about 65 thousand tons; whereas, Eritrea and Sudan have the smallest share production at about 13 and 7 thousand tons respectively (World Resources Institute, 2006).

Comparing the percentage of fish resource population with in 100km from the coastal, Eritrea has the largest concentration in the region (73%). This implies that Eritrea has comparative advantage (World Resources Institute, 2006). However, the sector has never made significant contribution to country food security. As a result the direct contribution of fish sector to the GDP has dropped from 0.38% in 1996 to 0.18% in year 1998 (MOF, 2000).

Moreover, the relative cheap price of basic commodities such as: food, fuel, and other spare part in Yemen. Eritrean fishermen encouraged to be part of the Yemen economy (Muir, 2001).

#### International comparison

Table 6 shows the total production of Africa fish and fish products in 2000; and the seven leading countries were Morocco, South Africa, Egypt, Senegal, Ghana, Nigeria and Tanzania. The production of these countries accounted for 60% of the total African production level (World Resources Institute, 2006). However, the per capita food supply of fish and fish product was higher in

**Table 6.** Aquaculture production of Africa in 2000

Countries	Production in thousands (tons)	In percentage	Per cap food supply fish & fish prod. (kg/person)	% pop. with in 100km of the coast
Morocco	969.73	16.71%	8	65.00%
South Africa	656.93	11.32%	6	39.00%
Egypt	507.88	8.75%	13	53.00%
Senegal	405.72	6.99%	28	83.00%
Ghana	380.53	6.56%	31	42.00%
Nigeria	359.61	6.20%	9	26.00%
Tanzania	116.2	2.00%	8	84.00%
Other Africa	2407.5	41.48%	8	
Total	5804.1	100.00%		

Source: world resources institute, 2004

Ghana and Senegal that is at about 31 and 28 kg/person respectively, whereas, 8% South Africa. The fish resource population concentration with in 100km from the coast: Tanzania has largest concentration in Africa (84%).

The production level remains static in many countries such as in Kenya, Cote d'ivoire, and Zambia; whereas it has declined in Liberia, Zimbabwe and Somalia. This decline attributed due to relatively low level of economic development, lack of business scene transparency, lack of collaboration, and inefficient health and quality control (FAO, 2001).

### Role of government

The focus of the government is to be ensure food security from fish production, and make the country a net-exporter. To achieve this objective Semhar project fishery development was launched (MOF, 2001).

The emphasis of the Semhar project is to produce fish for exports. Specifically the project focuses on:

- Supporting the private sector, in providing cool storage and freezing facilities, and market information.
- Supporting fishermen in identifying appropriate species for export markets; and Fulfilling the standard requirements of quality and safety measures (MOF, 2001).

Apart from this, currently the fishing communities in the project area have limited electricity supply and insufficient access to the cool storage (Muir, 2001).

### Conclusion

Red sea being underexploited resource; and it is unique opportunity for the development of the country (MOF, 1997). However, this comparative advantage has never been converted to competitive advantage.

According Porter (1990), competitiveness is defined as environment that promotes creation of competitiveness

advantage through a sustainable national productivity. However, contradictory to this concept, the Eritrea fish productivity is declining from time to time due to: weak sea territory control (as a result the resource become illegal smuggled to neighbour countries); shortage of fishing materials (such as ice, convenient receiving center and preserving); credit availability; and culture. These are among the main problems that need to rethink critically by the policy makers. Moreover, the ministry of fisheries as an agency of the government need to develop proper and functional sustainable management of marine resources in protecting and preserving the marine habitat; and work toward integrated and improved marketing channels. Specifically all the stockholders in the fish supply chain channel need to concentrate on:

- Increasing production and exporting valuable marine products;
- Provide conducive environment, that encourage investment opportunity;
- Protect the marine habitat from over and under exploitation;
- Create marine awareness among the public through the mass media and the educational establishment;
- Encourage marine research activities; and
- Establishing effective data recording system.

It is also important to establish fish collecting and processing center closer to the fishing villagers (for instance at Dahlak Archipelago); this not only reduce fishing trip days, fishing input (ice and fuel usage), but also reduce weight loss and spoilage rate.

Moreover, fishermen are in need of expert assistance to determine technical and maximum economic yield that enable to reap high benefit from the sea resource and farming technique.

It is also important to improved local distribution net works such use hand-carts or small mobile units, for easy access to consumers.

This study confirm that exporters and policy makers need to take a strategic approach, in identifying target markets, and ways to build strong and sustainable market production. Moreover, the government and all private investors need to formulate how: to move up to the value chain; niche marketing opportunity; converting comparative into competitive advantage; specifically focus on the services revolution; and overcoming technical and structural barriers.

## REFERENCES

- Amin A (1999). An Institutional perspective on regional economic development. *Int. J. of Urban and Regional Research*.23:365-378.
- Collins R (1999). Developing Supply Chains in New Agricultural Industries: A Social System Approach. Paper presented at AEASA conference, club mykonos, Langebaan, sept. 20-22.
- Reynolds JE, Appleton J, Bellemans MS, Bozon A, Christy LC (1993). Fisheries of Eritrea sector review. FI: FAO/TCP/ERT/2251, Terminal report  
<http://www.fao.org/docrep/field/003/AB902E/AB902E01.htm#plch1> .
- FAO (1997). Eritrea: Fisheries infrastructure development project. 97/004/ADB-ERI.
- FAO (2000). The state of world fisheries and aquaculture. Rome, Italy.
- Family Health International (2006). Eritrea.  
<http://www.fhi.org/en/CountryProfiles/Eritrea+main+country+page.htm>
- Hahn MH, Ribeiro RV (1999). Heuristic Guided Simulator for the Operational Planning of the Transport of Sugar Cane, *J.I of the Operational Res. Society*, 50(5):451-60.
- Handfield RB, Nichols EL (1996). Introduction to Supply Chain Management, Prentice Hall: New Jersey. pp 162-168.
- Leedy P, Armrod JE (2000). Research Planning and Design. Merrill Prentiss Hall, USA
- Lupin HM (1999). Producing to Achieve HACCP Compliance of Fishery and Aquaculture Products for Export, *Food Control*. 10:267-75.
- MOF (1997). Policies strategies and programmes. Ministry of Fisheries, Eritea. Massawa.
- MOF (2000). Executive Summary of the Ministry of Fisheries Report. Massawa, Eritrea.
- MOF (2001). Executive Summary of the Ministry of Fisheries Report. Massawa, Eritrea.
- MOF (2002). Fisheries resources management department annual report. Massawa, Eritrea.
- MOF (2003). Fisheries resources regulatory and service department annual report. Massawa, Eritrea.
- Muir JF (2001). Aquaculture development trends: perspective for food security. Paper presented at international conference on sustainable contribution of fisheries to food security, Kyoto,, Japan, 4-9 Dec.
- Negash T (2003). Red Sea: A hope of development and progress. Article on Haddas Eritrea.
- News paper 12:219, Asmara, Eritrea.Poirier CC (1999). Advanced Supply Chain Management: How to Build a Sustained Competition, publishers Group West: San Francisco.
- Porter ME (1990). The competitive Advantage of nations. Macmillan, London. pp. 260-281.
- Scovazzi T, Reynolds JE (1992). Initial considerations and proposals for an Eritrean fisheries legal framework. Sector Studies of FAO, No. 1. Rome, Italy.
- Tom T (2000). Environmental & Natural Resource Economics. Addison Wesley Publisher, New York, USA.
- Van der Voorst JG, Beulens AJ, Van Beek P (2000). Modelling and Simulating Multi-Echelon Food Systems, *European J. of Operational Research*, 122(2):354-67.
- Wessells CR (2002). The Economics of Information: Markets for seafood Attributes, *Marine Resource Economics*, 17:153-62.World resources Institute (2006). <http://earthtrends.wri.org>
- Yemane G (2003).Personnel communication. Asmara, Eritrea.