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Status of Fisheries Postharvest Industry in the Sultanate of Oman: Part 1-Handling and Marketing Systems for Fresh Fish

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Abstract: The Omani fisheries sector is an important contributor to the national food supply system and also a vital source of export income and employment, particularly in the rural areas. During the past decade, however, the performance of the sector has lagged behind governments projections to increase its share of the total Gross Domestic Product (GDP). In recent times, significant changes have occurred in fish postharvest handling and marketing systems in response to market demands for consistent supply of quality products. The objective of this study was to investigate the postharvest handling practices and marketing systems adopted by fishermen and traders in Oman. Our study showed that small-scale fishermen and traders dominate the Omani fresh fish sector. Marketing occurs mainly at the landing sites and to a lesser extent in purpose-built market stalls built by the government. Middlemen (often called truckers) play an important role in fish marketing across regions and within districts in the same region. Based on the description of existing technologies and infrastructure used, recommendations are made for overall improvement of the postharvest system as a strategy to enhance the delivery of good quality and value-added fresh fish to end-users.

Key words: Fresh fish, handling systems, marketing systems, postharvest, small-scale fishers, truckers, Oman

INTRODUCTION

Fish is an important source of protein and its harvesting, handling, processing and distribution provide livelihood for millions of people as well as providing valuable foreign exchange earnings to many countries. Fresh fish is a highly perishable food product that requires proper handling, processing and distribution to ensure that it can be utilized in a cost effective and efficient manner. Global demand for fish is growing and understanding existing handling and marketing channels is essential to maintain reliable supply chains and profitable fisheries sector Delgado *et al.*[1,2] William[3]. In 2002, total world trade of fish and fish products increased to US$58.2 billion (export value), representing a 5% increase relative to 2000 and a 45% increase since 1992. In terms of quantity, exports were reported to be 50 million tonnes (live weight equivalent), having grown by 40.7% since 1992, but showing a slight decline (1.0%) compared with 2000 levels.

The Sultanate of Oman occupies the south-eastern corner of the Arabian Peninsula and has a total area of 312,500 km^2. It is bordered in the north-west by the United Arab Emirates, in the west by Saudi Arabia and in the south-west by Yemen. The country has a coastalline of almost 1,700 km (up 3,165 km in fine scale) from the Strait of Hormuz in the north to the borders of the Republic of Yemen in the south-west, overlooking three seas: The Persian Gulf, the Gulf of Oman and the Arabian Sea (Fig. 1).

The coastline stretches from the Indian Ocean in the east to the Persian Gulf in the north. This unique geographical location fertilizes the seas and Omani marine environment with a huge variety of fisheries resources. The fisheries sector is an important contributor to the overall national economy and it accounts for over 0.8% of the total GDP. The sector is dominated by small-scale fishermen and retailers (often family-oriented). More recently, some commercial fishermen and fishing companies have emerged as part of the government's efforts to diversify the economy and promote private sector enterprise, particularly in the fishing communities. The government has also built new harbours near the major fishing cities and also new marketing facilities near the landing sites.

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Fig. 1: Map of the Sultanate of Oman, showing the main administrative cities

Based on an extensive review of the literature Opara *et al*.,[4] and personal contacts of the authors with key industry players, there is a dearth of information in the scientific literature on the status of the postharvest handling and marketing systems in the Omani fisheries sector. Such information is vital for the development of appropriate technological and structural interventions to improve the postharvest handling and marketing of fresh fish to optimise the value and contribution to the economy.

The objectives of this study are to briefly highlight the changes in the landings and economic value of fresh fish in Oman and to describe the postharvest handling and marketing systems currently adopted by fishermen and retailers. Recommendations are also made on appropriate technological interventions for overall improvement of the postharvest system.

METERIALS AND METHODS

Various historical data from official government records on the fisheries sector were synthesized in order to highlight changes in fish landings and value and the overall contribution of the sector to the national economy. Current postharvest handling practices and marketing system for fresh fish were studied using a combination of semi-structured interviews with fishermen and traders. Field visits were also made to four major fish landing sites and marketing facilities to observe and document the practices adopted by fishermen and retailers. The fish landing sites and markets visited are located in Seeb and Muttrah in Muscat Governorate, Barka in Batinah Governorate and Salalah in Dhofar Governorate.

RESULTS AND DISCUSSION

Economic importance of the fisheries sector in oman: Fish harvesting, handling and marketing is an ancient economic activity in Oman and this remains more or less the same today in most of the coastal communities. Current estimates of fisheries stock exceed 800 thousand tonnes MNE[5] and this represents renewable natural resources which can be optimally harnessed for economic development. In view of the considerable potentials of this sector, the government has projected to double in its 1% share of the GDP in 1995 in 25 years.

Despite its potentials to contribute to the government's goal of diversifying the economy through the shift from traditional to a modern sector, the performance of the fisheries sector during the recent 5-year development plan (1996-2000) was below projections. The relative contribution of the sector to the

Table 1: Actual share of the various economic sectors in total GDP (%) of Oman (MNE, 2001[5])

Sector	1995	1996	1997	1998	1999	2000	Annual Average (1996-2000)
Oil	37.2	41.4	39.2	29.7	38.1	47.5	39.1
Trade	12.8	12.3	12.7	15.5	12.8	10.6	12.8
Non-Oil export	4.7	4.0	4.0	4.6	4.3	5.4	4.5
Banking	2.6	2.5	2.9	3.6	3.6	3.0	3.1
Agriculture	1.8	1.7	1.8	1.9	1.8	1.3	1.7
Gas	0.9	0.8	0.9	1.2	1.1	1.3	1.1
Tourism	0.9	0.9	0.9	1.0	0.9	0.7	0.9
Fisheries	1.0	0.8	0.9	0.9	0.9	0.6	0.8
Electricity	0.6	0.6	0.8	0.8	0.8	0.6	0.7
Water	0.4	0.3	0.3	0.4	0.4	0.3	0.4
Mining	0.2	0.2	0.3	0.3	0.3	0.2	0.3
Insurance	0.3	0.3	0.4	0.3	0.2	0.2	0.3

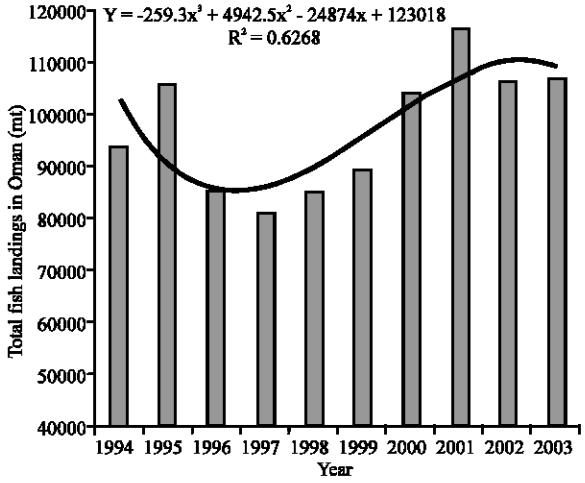

Fig. 2: Total fish landings in Oman over a 10-year period, 1994-2003

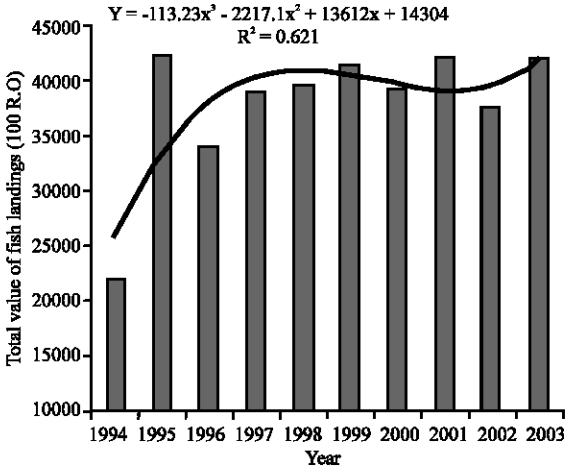

Fig. 3: Total value of fish landings in Oman over a 10-year period, 1994-2003

total GDP declined from 1% in 1995 to about 0.6% in 2000 (Table 1), equivalent to annual loss of about RO 1.5 million MNE[5]. Similarly, the share of fisheries export to total non-oil export also declined by 10.4% annually during the same period

Further analysis of the data on fish landings and value in Oman shows a steady fluctuation in production and value. Over the past decade, total fish landings by the traditional fishermen can be characterized by a period of decline (1995-97), followed by a steady rise in outputs (Fig. 2). In some periods, the rise in actual fish landings was not matched by an increase in the value of fish landed (Fig. 3). Whereas the overall production of the fisheries sector was low in comparison with the government's projection over the period 1996-2000, improper postharvest handling management practices resulting in quality degradation and physical losses have contributed to the problems facing the sector.

Recent estimates indicate that loss in quantity (thrown away) from commercial fishing ships ranges between 40-70% for the demersal fishes and up to 5% for the large pelagic fishes, while the quantity loss by traditional fishermen amounts to over 10% of the actual landings. In addition, annual loss in value due to downgrade in fish quality was estimated to worth nearly RO 24 million MNE[5]. These conservative estimates underscore the need for further indepth studies to identify the critical control points in the fresh fish supply chain in Oman and to development and implement appropriate technological, marketing and institutional innovations reduce these losses and thereby enhance the contribution of the sector to the national economy. Our recent studies at the fish landing sites and markets also highlight the prevalence of losses in both fresh fish quantity (physical loss) and quality Opara and Al-Jufaili[4]. Proper understanding of the postharvest handling and marketing system is important in identifying the critical control points for overall system improvement.

A generalised postharvest handling system for fresh fish in oman: Based on recent annual statistical reports MAF,[6] traditional small-scale fishermen account for

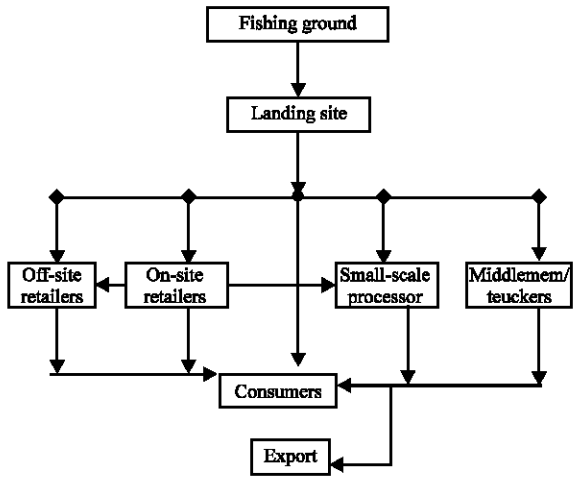

Fig. 4: A generalised postharvest handling and marketing system for fresh fish in the sultanate of Oman

about 86% of the total number of fishermen and landings in the fisheries sector, respectively. These fishing businesses are mostly family oriented, but often requiring hired labour to assist with hauling during peak season. A generalised postharvest handling and marketing system of fresh fish is summarised in Fig. 4. This shows that fresh fish harvested by traditional fishermen undergoes multiple handling starting at the fishing grounds until the product reaches the end-user. Understanding these handling systems that is predominantly based on small-scale enterprises is vital in efforts to improve the marketing system and enhance fish product through the supply chain. Obviously, the multiple handling links that exist in the supply also increase the potential for product damage and loss in value due to quality degradation.

Handling systems at the fishing grounds: At the fishing grounds, fish are hauled and packed inside a storage box which is either built into the boat or separate containers which can be lifted at the landing site. Ice flakes are added inside these boxes to extend fish storage life. Most fishermen interviewed prefer ice flakes instead of frozen ice to facilitate easy handling of the fish during landing (off-loading) and to keep them chilled (instead of frozen) as most consumers perceive frozen fish to be 'old' and of lower quality.

The hauled fish can be sorted onboard at the fishing ground or at the landing site. Sorting is done manually and subjectively Considerable fresh fish losses can occur at the fishing ground when fishermen catch more than the capacity of the storage containers on board. In this instance, the fishermen select better quality fish (based on size, variety and physical damage) and discard the others. Fish losses can also occur at the fishing ground and landing site when there is a delay of between the time of catch and hauling. In such situation, the affected fish may be thrown away (representing quantity loss) at the fishing ground or sold at lower price (quality loss) at the landing site.

Handling and marketing systems at the landing sites: The landing sites are commonly general markets, where the harvested fish is removed from the net or offloaded and sold. There are three main types of landing sites.

- Common fish markets
- Private landing sites where fishermen and traders meet for pre-arranged deals.
- Landing sites where fishermen use specialised fishing gear (e.g., beach sein) which requires them to handle the fish at the beach nearest/next to the fishing ground (this applies mainly to sardine and anchorvies). Fish landed with such specialised gear are either sold onsite, transported to common markets, or dried onsite for future sale. Fish marketing at the landing sites can occur next to the beach (open market) or inside dedicated market stalls (locally called *kabra*) built by the government.

Fish handling and marketing at the beach front: At the open market on the beach front, harvested fish are manually removed from the net (mainly sardines) by a gang and sold directly to consumers, retailers or other end-users. Usually, sardines are sorted (to remove damaged or spoilt fish) but not graded by size. Fish are commonly sold in pieces (not by unit weight); however, retailers and middlemen who purchase large quantities do negotiate a price for part or all of the fisherman's catch (per tonne or subjective assessment of the quantity).

Fisherman may sell their products directly to a range of buyers including onsite retailers, middlemen (often called truckers), hyper- and super-markets, small-scale processing companies and consumers. The retailers may be local buyers who resell their products onsite or retail shops who usually send their representatives to the landing site or fish market (*souq*). At the landing site or market stalls, retailers may also buy from auctioneers who sell on behalf the fishermen for a nominal fee.

Fish handling and marketing inside market stalls: There are different building designs available for handling and selling fresh fish. These range from simple shaded areas (called *kabra*) to fully air-conditioned buildings. Market spaces inside the buildings are allocated to retailers who pay a nominal fee. Typically, a retailer would have an old refrigerator (that is not functioning) or custom-made boxes containing ice flakes for storing fish. Our

observations during study visits showed that most fresh fish retailers use ice flakes; however, in the Barka market where there is no onsite ice factory, retailers use sea-water and/or chilled water to keep the fish fresh for the day. There is an ice factory located near most fish markets, which are usually open for 24 h. Fish are sold in pieces (e.g. RO 1.800 per medium size tuna) or per unit weight.

Handling and marketing at retail stores: Fish sold at the small-scale stores, super markets and hypermarkets are either frozen or stored in ice flakes. All retailer shops that we visited displayed their products on ice flakes and carried out minimal processing such as cleaning, cutting and filleting. Fish are commonly sold per unit weight basis. Postharvest handling and minimal processing at small-scale retail stores are usually carried out manually while the supermarkets and hypermarkets use modern labour-saving devices as electric knives and high-pressure water hoses for cutting, cleaning and filleting such.

Handling and marketing by middlemen: Middlemen (also referred to as truckers) play a significant role in the postharvest handling and marketing of fish in Oman. Some fish species are harvested predominantly in some communities and the middlemen are responsible for transporting and selling them to other distant communities which such fish species would otherwise be scarce. Some middlemen transport their products inside refrigerated trucks while others store their products inside large fiberglass containers with ice, which are transported using medium-size trucks. A common problem which we observed with the later type of containers is that they often have the opening at the top which makes it rather difficult to offload the fish and to clean the container.

Truckers sell their fish near the beach front or close to the fish market stalls, but there is generally no dedicated areas at these locations for the truckers to display their products. Products are sold in pieces to consumers and in bulk to other retailers and wholesalers. Some local fish market authorities (Muttrah) have placed restrictions on the middlemen such that they are only allowed to sell at these markets during designated periods in the day. However, other fish markets (such as Seeb and Barka) allow the middlemen unrestricted access to sell their products. Consequently, most truckers choose to go to the former markets first during the day to enable them achieve optimum access both types of market.

CONCLUSION

Despite its historical importance through rural employment and income generation, the fisheries sector currently ranks lowly (#8) among the twelve main industrial sectors in the national economy. Evidence from historical data on the quantity and value of total fish landings indicate that there is ample opportunity to enhance the economic value of fish and the contribution of the sector to the overall national economy. Ongoing efforts by the government to diversify the economy and enhance the contribution of the fisheries sector must therefore include the improvement of existing postharvest handling and marketing systems in the sector. Good postharvest handling and marketing are essential operations for consistent delivery of high quality, safe and nutritious fish products to the consumer. Implementation of improved postharvest quality techniques and procedures also provide new opportunities for value-addition and employment generation.

Based on the findings from this research, the following conclusions and recommendations are made:

- Small-scale, traditional fishermen and retailers still dominate the Omani fisheries sector.
- Fishermen and retailers adopt simple postharvest handling and preservation techniques, which appear generally inadequate for successful long-storage storage and marketing.
- Fresh fish handling and marketing occurs mainly at the landing sites. These environments expose the product to extremee temperature conditions that accelerate rapid fish deterioration and loss in value.
- There is a perversive strong perception among fishermen and retailers that frozen and/or gutted fish are not fresh and wholesome and thus would negatively affect their sales. This perception appears to influence their attitudes towards the adoption of technologies (such as freezing and gutting) which could extend product shelf-life and facilitate the exploitation of better marketing opportunities.
- There are dedicated fish marketing stalls and other postharvest infrastructure near the landing sites in the major fishing communities. However, some of these facilities are badly maintained and not fully utilized. In some locations, the facilities were considered to be inadequate due to increase in fish landing marketing activities.
- Current estimates on the incidence of postharvest losses indicate that losses in both quantity and quality are unacceptly high. Preliminary observations at landing sites and fresh fish markets also indicate that the incidence of postharvest losses is common and appears to limit the economic potential of the sector.

- There is a need for coordinated research to assess the impact of current postharvest handling and marketing systems on the magnitude of fish losses and to identify the critical control points so that appropriate interventions could be developed to mitigate the problem.

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