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REVIEW

Production and marketing systems of farmed tilapia in China

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Tilapia has become one of the major species of aquatic products in close link with both domestic and international markets. Nowadays, the demand for fish and fisheries product has being exacerbated by the continued increase in human population the world over. This was due to the fact that global captured fishery was declining following the increased human exploitation for the commercially important fishes. Aquaculture or fish farming has become one of the solutions to maintaining the continuous supply of fish to commercial markets. China was by far the largest producer and exporter of tilapia products irrespective of some constraints such as soaring production costs, price and weather fluctuations. In the country, tilapia production was mostly carried out in the southern and southeastern coastal areas where subtropical conditions favored the growth and reproduction of the species. This paper reports on production and marketing systems of tilapia in China. Tilapia products produced in China had to pass through different channels before reaching their final consumers. Major international markets for tilapia products produced in China included among others, the United State, European Union and Russia. This work will guide potential investors and competitors for tilapia market in China and the world at large.

Key words: Tilapia production, marketing system/channels, export, China.

INTRODUCTION

Tilapia is an important food commodity, commercially produced in many South-east Asian countries, with Nile tilapia being the most important species (El-Sayed, 2006). Tilapia farming industry in China is evolving rapidly. China is by far the leading tilapia producing country and is currently producing one half of the global supply (Fitzsimmons et al., 2007). According to Lai and Yang (2008), this prosperous tilapia production in China is being practiced in the Southern part of China, using almost all types of culture systems with different Intensifications. The increased tilapia production in China can be attributed to the wider acceptance of the species at the international market (Zhao, 2011), owing to the fact that, the local market is less rewarding and yet developing (Yang, 2010). China Customs bureau report for the first quarter of 2012 revealed that, in 2011, the country exported a rounded sum of 330,300 tonnes of fresh and frozen tilapia to the US; and exceeded 2008 export by 32%.

Just like any aquaculture venture, the success of tilapia culture depends on the marketability of the products and the wise and efficient use of the available resources (Bardach et al., 1972). According to Ruddle and Grandstaff (1978), tilapia industry can be categorized into three subsystems of aquaculture: procurement, transformation, and marketing; wherein, the formal includes procuring of production inputs such as seed, feed and labour. Transformation subsystem on the other hand includes the production process wherein seed stock

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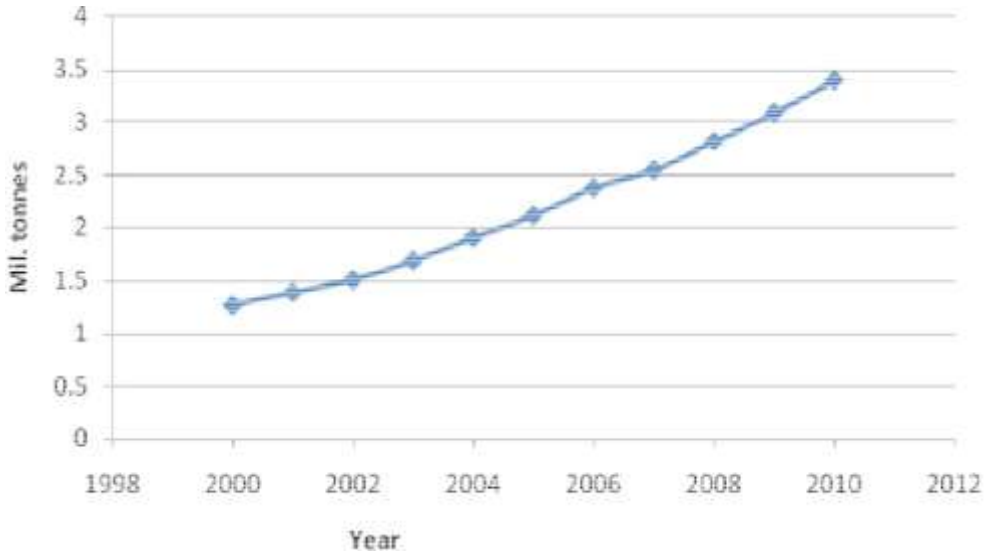

Figure 1. Trend of global Tilapia production from 2000 to 2010 (FAO GLOBEFISH).

is reared to marketable sizes. Marketing, as a subsystem encompasses both domestic and foreign exchange, and includes the various marketing intermediaries and consumers.

Commercial production has become popular in many countries around the world and the traditional markets which were in Asia and Africa have expanded in many countries within Europe and the US (Maribel, 2002).In China, the marketing system of fish such as tilapia in cooperate many activities stemming from harvesting, processing, selling and consuming; which can be referred to as marketing channel, distribution channel or supply chain. Marketing system of tilapia is largely controlled by the following factors in the production systems *viz*: (1) production cost, (2) operating costs, (3) competition among producers; (4) degree of processing, (5) production scale and consumers' demand (Pillay, 1994). While the Marketing channels for tilapia product are governed mainly by the nature of the products, the end consumers and the characteristics of the farms; though the product sold from aquaculture farms are generally for human consumption (Beveridge and McAndrew, 2000).

Global trade in tilapia has witnessed an impressive flourishing in the last two decades, this according to Vunniccini (2001), is expected continue. In some countries famers can market their products directly to consumers whereas, in most cases, farmers may need to use middlemen during production chain. In China, marketable sized tilapia reach the market outlets through middlemen who act as go-in- between in the production system. This paper reports on production, marketing channels and mode of distribution of tilapia to the respective buyer or market outlets. Furthermore, this paper enlisted constrains encountered by farmers in the production and marketing of tilapia.

GLOBAL TILAPIA PRODUCTION

Some eighty-five countries across the world are culturing tilapia (Gupta and Acosta, 2004). Historically, tilapia was produced and consumed mainly in Africa and Asia, but nowadays has gained increased acceptance among consumers in developed and developing countries thereby forming a network of markets (Ferdouse, 2001; Vunniccini, 2001). Apart from catching consumers' attention around the world, tilapia also plays a significant role in global aquatic production through culture-based fisheries; more so as global captured fishery is declining. Tilapia production continues to bloom and is showing a steady increase yearly. In 2000 to 2010, tilapia production increased from 1.27 million metric tons (mt) to 3.4 million mt (Figure 1). China, among other countries is the largest contributor to the 2010 global tilapia production (Figure 2).

TILAPIA PRODUCTION STATUS IN CHINA

Tilapia production in China continues to increase, reaching 1,330,000 mt in 2010, compared with the 600,000 mt in 2000 (Figure 3). This production follows a smooth trend from 2000 to 2010, although it dwindles from 2006 to 2008. Quality seeds, water availability, labor and farming experience, according to Zhao (2011) are key factors that have contributed to the rapid growth in tilapia production. The quality of seed stocked during the production cycle normally determines the survival rate of the fish (Xiao et al., 2012), which in turn will determine the yield, and informs the total revenue at the end of the production.

The fall in production (1,110,000 mt) in 2008 reflected a

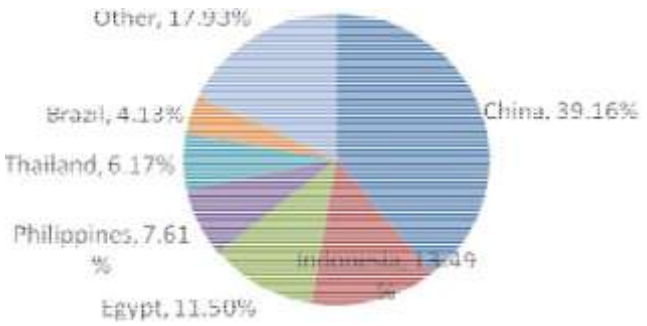

Figure 2. Major Contributors to 2010 global tilapia production (FAO GLOBEFISH).

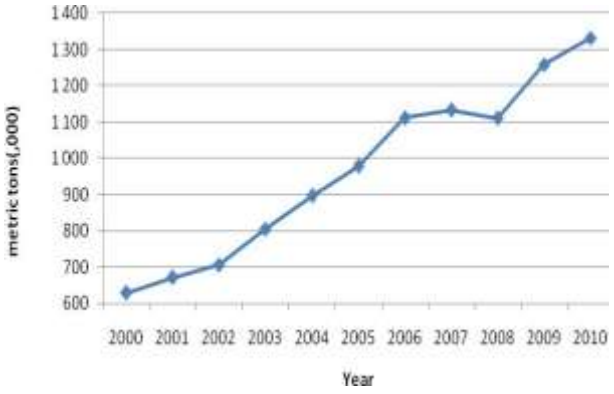

Figure 3. Tilapia production trend in China from 2000 to 2010 (Statistic unit, MOA).

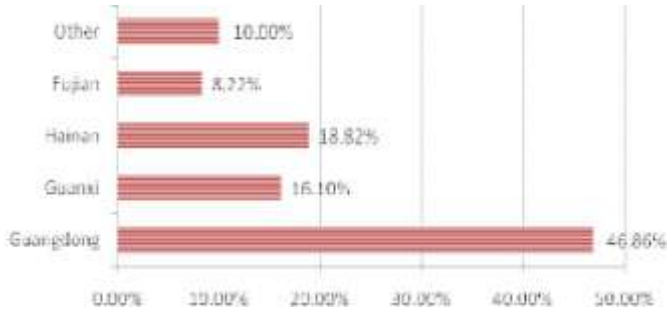

Figure 4. Percentage tilapia production of the major producing provinces in 2010 (statistic unit, MOA).

representing 40.62%, which was higher than the 39.16% 39.29% decrease. This fall according to Helga (2010), was due to price hikes within the production chain. Liu et al. (2012) further explained the rationale behind the decline, which according to their studies, was due to very low temperatures at the beginning of 2008; which informed the 25% decrease in production with reference to 2007. After the prices for major input reduced in 2009, the production recovered, acounting for 1,258,000 mt, obtained in 2010. Furthermore, a sharp increase in production was also observed in 2010 reflecting a 49.51% compared to previous years.

Currently major tilapia producing provinces in China are Guangdong, Hainan, Guangxi and Fujian. In 2000, tilapia production in Guangdong was 249,446 (39.6%), Fujian 105,589 (16.8%), Guangxi 102,886 (16.4%), and Hainan 64,786 (10.3%) mt (Lai and Yang, 2008). Out of the 1,331,890 tonnes of tilapia total production in 2010, Guangdong continues to be the leading province (Figure 4), contributing 624,178 (46.86%), followed by Hainan with 250,645 (18.2%), Guangxi with 214,404 (16%) and Fujian with 109,450 (8%) mt.

DISTRIBUTION CHANNELS OF FARMED TILAPIA PRODUCTS

Transformation of the seed into marketable size product is only one half of the battle, since the farmer will only obtain the output in the form of profit after the produced products are being sold to the market. This makes it very crucial for farmers to create mutual profitable partnerships with the market outlet as they would not compromise their profiteering adventure, in a bid to ensuring a sustainable tilapia industry. Before this time, when aquatic farming was in its rudimentary stage, it was meant to make available fresh products for the farmers and their families or their local communities. Lately, the production has expanded and the market has extended. Depending on the market demands and requirements, tilapia products in China can be distributed domestically or internationally to the market outlets. Generally, one or more intermediaries may be involved in the marketing of the products and naturally; a mark of price is tagged at each stage (Stigler, 1969).

In China, there are a variety of market outlets ranging from local/domestic market, to processing manufacturers up to the international market. Most marketing for farmers is done by the middlemen, since cooperative marketing is not too pronounced. Nevertheless some famers can still sell their product directly to the local market or to processing companies. The marketing channel for Tilapia products in China can be divided in two (Figure 5). First marketing channel start from the producer to domestic market, then to the consumer. The Second one is a bit long, starting from producers to processing companies, international market, then to the consumers. No matter the route used in the distributed channel, the end users will be the consumers. Most of the time, farmers may sell the entire production of live-fish to the middlemen, and then the fishes will be distributed according to the market outlet demands. During harvesting, farmers hire the harvesting team and buyers provide transportation for their fishes. Competition for international market has caused some processing companies to culture their own fish, so as to evade risk from buying poor quality ones from other farmers; in a bid to conforming to quality

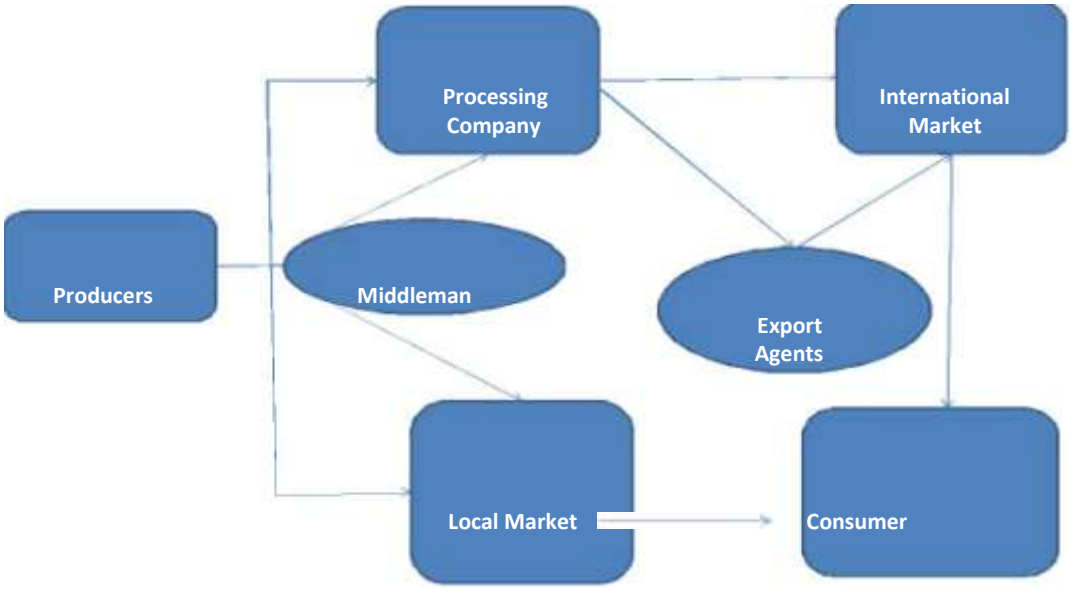

Figure 5. Schematic representation of distribution channels of tilapia product.

Table 1. Tilapia production, proportion exported and quantity retained for domestic market (China Custom Bureau).

Year	Total production (mt)	Exported quantity (mt)	Domestic quantity (mt)
2002	707.000	26.000	681.000
2003	806.000	52.000	754.000
2004	897.000	67.000	830.000
2005	978.000	80.000	898.000
2006	1111.000	274.000	837.000
2007	1134.000	521.000	613.000
2008	1110.000	548.000	562.000
2009	1258.000	672 .000	586.000
2010	1332.000	799.000	533.000

assurance required for exportation.

TILAPIA EXPORT FROM CHINA

The development of international export trade markets has had a significant effect on production and marketing of aquaculture produce in recent years. In the past, aquatic products were seldom sold beyond the local markets. Today in China, fish commodity such as tilapia can be sold both domestically and internationally. The export potential has attracted governmental and private sector's interest and support; as most countries give high priority to increased foreign exchange earnings for a favorable balance of international trade.

In China, international trade of tilapia is being promoted by allowing taxed free exportation; this has prompted the processing companies to focus more on exportation than domestic marketing. Before this period (2002 to 2007), the proportions of the total tilapia production being retained for domestic market were far more than half of the total production (Table 1). However, the table has turn due to the expansion of the international market and exportation promotion of a no tax charged for exporting, granted by the Chinese government. With this promotion, export volume is expected to increase steadily everything being equal. The United Nations Food and Agriculture Organization (FAO) fishery statistics data (2010), acclaimed China as leading producer for tilapia and its main importer being the United States. In 2010 for example, total export quantity reached 797, 000 mt, accounting for 60% of the total production, with a corresponding total domestic quantity of 533,000 mt. Consumers' preference and alternative goods are yet another factor to reckon with when dealing with supply of aquatic products. USA received the large chunk of

Table 2. China's Export and trade value obtained per importing country for 2010 and 2011 (China Custom Bureau).

Importing country	Export quantity from China (metric tons)		Trade value (100 million US dollar)	
	2011	2010	2011	2010
United State	150.600	168.800	5.99	6.09
Mexico	46.800	43.200	1.57	1.24
Russia	15.300	20.300	0.66	0.68
European Union	29.600	27.9	0.9	0.8
Total	330.300	322.800	110.900	100.600

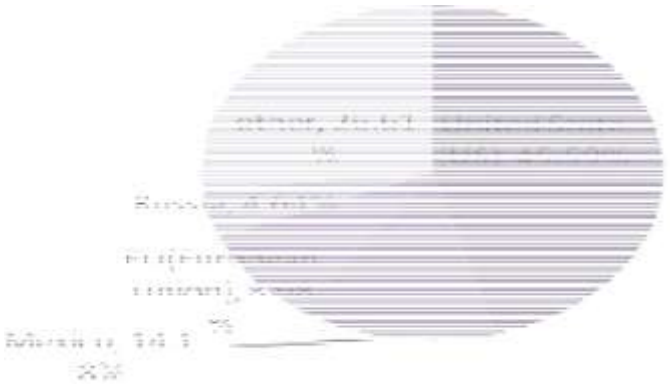

Figure 6. China's 2011 Export to the main importing countries (FAO GLOBEFISH).

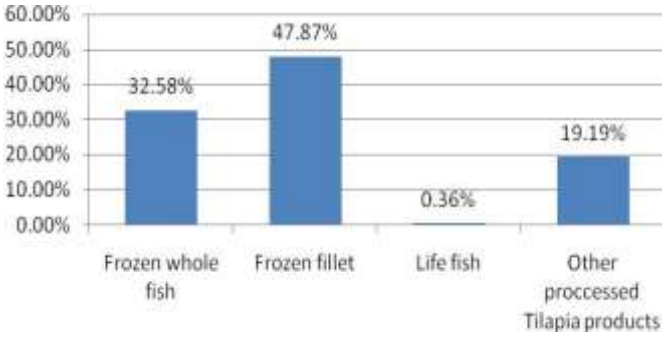

Figure 7. Export products from China to the importing countries for the year 2011(FAO GLOBEFISH).

exported tilapia from china (Figure 6), and is in conformity with what Carel et al. (2007) and Harvey (2001) reported and suggested respectively. In 2011, a total of 45.59% was exported to the US; 14.18% to Mexico; 8.98% to EU and 4.64% to Russia, whiles others (26.61%) accounted for cumulative quota sent to Africa and other countries.

In 2011, US import drop by 10.78% compared to 2010 import volume (Table 2). The export value also showed a percentage decrease of 1.64. EU and Mexico showed a percentage increase of both trade quantity and value, while Russia follows the US with a decrease.

The main tilapia processed products in China are sold frozen whole fish, frozen fillet, fresh fish fillet, salted and/or smoked products, and canned and roasted fish fillet. China has earned a reputation as a producer of low cost frozen fillets for export in recent years. The real market setter for tilapia products is frozen tilapia fillet which made up 48% exports in 2011 (Figure7).

The majority of fish for domestic markets are still sold live to local restaurants in the provinces of China. Guangdong province not only leads with almost half of all production in China, it also contributes much to the exported volume. The neighboring provinces such as Hainan, Fujian and Guangxi are also contributing to international market quota.

CONSTRAINTS

Major constraints of tilapia production in China include, though not limited to the following.

Soaring production costs

The costs for labor, feed, rent, chemicals and infrastructure have greatly increased lately. Although China used to maintain lower rates for labor in the past, the rates for labor have shoot-up by at least 50% over the last three years. Aside from labor cost, other major input prices have also increased significantly. Higher costs and lower market prices for the products have an inverse relation to profit making; and are increasing the risks involved in entire production thereby discouraging many tilapia farmers from investing. Just as the cost of labor has increased dramatically, currency exchange rates have also inflicted pressure.

Price fluctuation

The market price of tilapia has changed drastically over the past few years. In 2009, the market price of 500-g live tilapia from farmers dropped by U.S. $0.16 /kg. Reacting to this, many tilapia farmers began to stock carp or other species instead of tilapia. This drop in price caused Guangdong, Guangxi, Hainan and Fujian Provinces to lower their scale of production.

Weather fluctuation

Severe weather fluctuations are negatively impacting tilapia production lately. While high summer temperatures may have increased disease-related losses of tilapia, the very low temperatures at the beginning of 2008 directly reduced tilapia output by 25% (230,000 mt) with reference to 2007. In addition, many tilapia ponds suffered damages that caused hundreds of thousands of broodstock and millions of grow out to escape out of their confinement. The farms in Hainan for example suffered some 80% farm loss.

Inadequate cooperation and communication network

The major reason why many producers are incurring losses in their production venture is due to the weak cooperation and poor communication of market dynamics. Production trend and marketing information are liable to change with time, but with improved cooperation and communication network among market actors, future change can be forecasted and timely communicated to parties involved; this will abate losses and aid in the monitoring of market capacity for importing countries and changes in consumers' preferences, buying patterns and earnings. Farmers need to have contingency marketing plans so as to tackle the temporary or long term loss of export market; this therefore call for diversification of tilapia market, and exploring other importing countries in order to reduce the marketing risks.

National brand, policy bottleneck and international accreditation

The world market now demands healthy aquaculture products from farm to table. Compliance to international regulations will foster international trade of tilapia. In China, most processing companies whose raw materials is live tilapia, would like farmers to comply with key standard operating procedures. Nevertheless, some tilapia producers still find it difficult to comply with such regulations, claiming that it adds to their production cost; and this informed the huge volume of tilapia products in the domestic market during the early 2000 (from 2000 to 2007). Now, with government support of tax free exportation, farmers are making effort to comply with the International Standards of Operation (ISO) and Hazard Analysis Critical Control Point (HACCP) which informs the present status of China's exportation of tilapia products to the international markets.

CONCLUSION

Tilapia production in china is carried out mainly in Guangdong, Hainan, Guangxi and Fujian provinces, with Guangdong being the leading province. The production trend of tilapia in China has changed due to rising market demands and favourable production and export policies granted by the Chinese government; this is expected to continue, everything being equal. Tilapia products produced in China reached its final consumers through a system of marketing within the production chain. Larger quantity of tilapia products from China are exported to the US market through a marketing system that involves middlemen. Irrespective of some constraints, tilapia producers in China are thriving to keep up with the needs of their commercial market, by adopting international regulations on quality assurance. Findings in work could be of interest to potential investors and competitors for tilapia market. Future studies should be done to ascertain whether other tilapia products such as tilapia fish oil can have a market and whether export agents can supply directly to the consumer.

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