

World Market of Tilapia

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1 Introduction

Tilapia is one of the most favourite fish cultured in the world, and production is growing very strongly. Nevertheless, also wild tilapia production is important. Tilapia is together with carp one of the widest spread farmed fish species in the world, with production carried out in some 75 countries. Already some 50 years ago tilapia was praised as the “fish of miracles”, the fish that would solve all the protein problems of developing countries and the increasing demand for fish in the developed world. Then some problems with its farming led to long years of silence, from which tilapia came back as the fish of the decade, or the fish of the millennium, at the end of ‘90s.

While tilapia was well known in many areas of Asia and Africa since centuries, developed countries have discovered tilapia only two decades ago. The white flesh is very tasty, and tilapia recently entered the top ten among US preferred fish species. Optimistically some analysts are forecasting that tilapia will replace many of the traditional wild species, under danger of overfishing.

Tilapia is a relatively fast growing fish with low feed requirements. Tilapia can be fed practically any feed, and still delivers first class fish protein. In some instances, the feed can have a very high vegetable component, especially when compared to salmon or shrimp culture. Tilapia can grow to a marketable size of 250-450 g within eight months, even when fed primarily with vegetable feed. In view of this quick growth, tilapia is sometimes called the “aquatic chicken”.

Tilapia can be grown anywhere where water is available, some species even grow in brackish or salt water. The only problem is the water temperature, which should not fall below 18°C. With the relative good price tilapia manage to receive in developed countries, more intensive and modern fish farms are put up in developing countries.

The product coming from tilapia has a very nice colour, white or slightly pink, and a very mild taste. The flesh is firm, and stays unchangeable in the preparation and cooking. Because of these positive characteristics, tilapia fillets are often compared with the quality of American catfish, red snapper or even cod. The flesh has a medium fat content, but a very high protein content. The supply is stable and can be programmed easily, as most of the product on offer in Europe or USA comes from farms. Tilapia aquaculture is sustainable, an argument which will have an even bigger impact in coming years.

One major shortcoming, especially in Europe, is the relatively little knowledge of the consumer with regard to tilapia. This lack of knowledge does not only exist with regard to the origin and the way of raising of tilapia, but above all with its preparation in the kitchen. Like many other “exotic” species, tilapia has to be explained to the consumer, with concrete market promotion. As tilapia often comes from small farms, the interest and competence in carrying out this type of market promotion is still lacking.

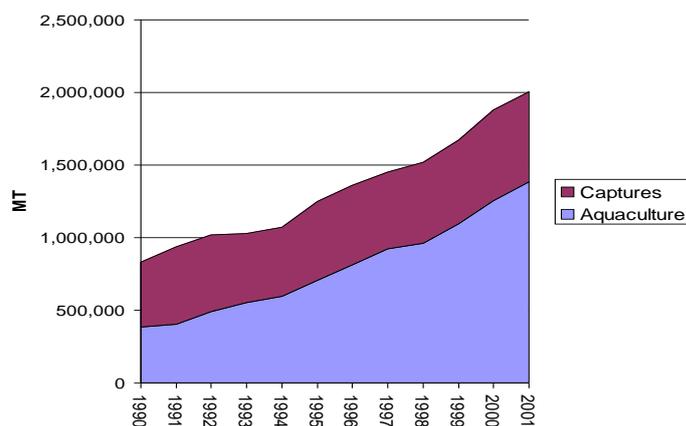
The tilapia market is expected to increase strongly, and in this study some examples of investments in tilapia in many countries are given. Price of tilapia is expected to go down, on the wave of increased production. In the USA, the price of fresh tilapia fillets is at present

(December 2003) US\$ 3.65/lb, which compares to US\$ 2.85/lb for catfish. By comparison, the EU market is still relatively small, but growing very strongly.

Tilapia is thus on its way to become a major supplier of protein both in the developed and the developing world. Fortunately, there is no risk that increasing tilapia imports into the USA or Europe will take away affordable protein from the poor of the world, as the tilapia going as cheap products on the local markets would not be sellable on the Western market. These tilapia coming from intensive farms, from small water areas or rice farms are generally very small and not very homogenous. On the other hand, the product going for export is of constant quality, size, colour and texture. It is to be hoped that the increase in production and exports of tilapia will increase employment in the producing countries.

1.1 Production

Graph 1: Tilapia Production – Capture versus Aquaculture



Source: Fishstat+

Once considered a low value fish, tilapia has in recent years gained a wider consumer acceptance. Tilapias are one of the major groups of farm-raised fish in the world and until a few years ago the bulk of the tilapia production was consumed locally, with Africa and Asia as traditional markets. Only in the last few years a growing acceptance and consumption of tilapia picked-up in non-traditional countries and not only by world-wide Asian and

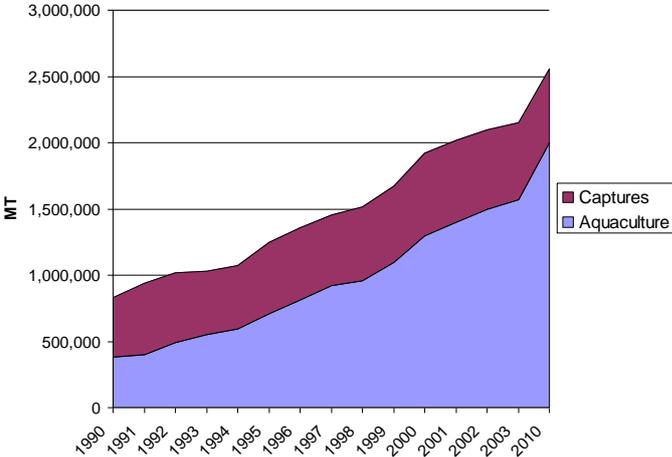
African communities as at the beginning.

The group called “tilapia” is made up of 60 species, from which ten are used as food fish. The origin of this species group is the lakes of tropical Africa and of the Near East. The typical environments are rivers, lakes and small water areas. Some tilapia can stand salt content to up to 10 percent, which is almost three times the concentration of salt in normal seawater. Water temperature can go from 15-40°C Celsius, and oxygen content of water can be relatively low. Some species like vegetable feed, including algae. In some places, tilapia are grown to control aquatic plants. In some cases, tilapia are also used to control water areas, including disease problems in shrimp farms.

Large-scale production and international trade of tilapia products flourished in the 1980’s and more impressively in the 1990’s, but many believe the most consistent growth is yet to come. Tilapia’s prices are competitive and this species may represent an important substitute for whitefish species that are in short supply. World tilapia production has been booming during the last decade, with output doubling from 830 000 MT in 1990 to 2 million MT in 2001. Table 1 shows very clearly that aquaculture was the main responsible for the increase, while

capture fisheries of tilapia stayed more or less stable over the years. Tilapia from the wild were reported to be 620 000 MT in 2001, while tilapia from aquaculture reached 1.4 million MT in 2001.

Graph 2: Forecast for year 2010



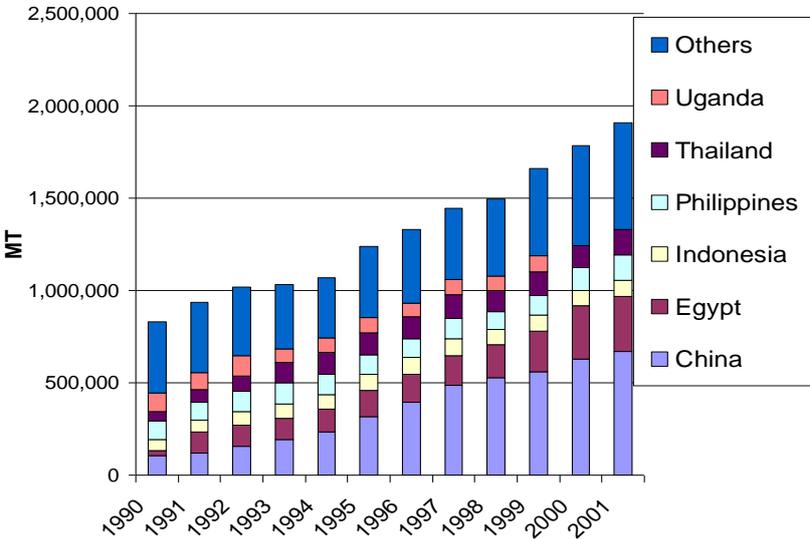
Source: author's estimates

When looking at the production figures and forecast for the main producing countries, it becomes clear that this year (2003) total tilapia production will exceed 2 million MT, with three quarters coming from aquaculture. For the year 2010, total tilapia production is expected to exceed 2.5 million MT, with about 80% of the total tilapia production coming from aquaculture. Tilapia is thus becoming one of the main species cultured, even overtaking shrimp or salmon.

Table 1: Tilapia production, aquaculture versus capture 1990-2002, and forecast for year 2010 – in 1000 MT

	1990	1992	1994	1996	1998	2000	2002	2003	2010
Aquaculture	384	488	596	812	960	1,300	1,499	1,572	2,000
Captures	447	529	474	546	558	620	600	580	560
Total	831	1,017	1,070	1,358	1,518	1,920	2,101	2,152	2,560

Definitively among cultured fish species entering international trade, tilapia will become the most important one in coming years. Developing countries are the main producers for tilapia, and production is growing in all regions and in many countries.



Source: Fishstat+

Graph 3: Total tilapia production, by country – in MT

China is by far the main tilapia producing country, with 670 000 MT in 2001 which is more than 5 times the 1990 production. Also Egypt reported an impressive increase in production during the past year from 25 000 MT

to 300 000 MT. On the other hand, production in Indonesia and the Philippines have stayed stable during the past decade (120 000 MT and 130 000 MT respectively).

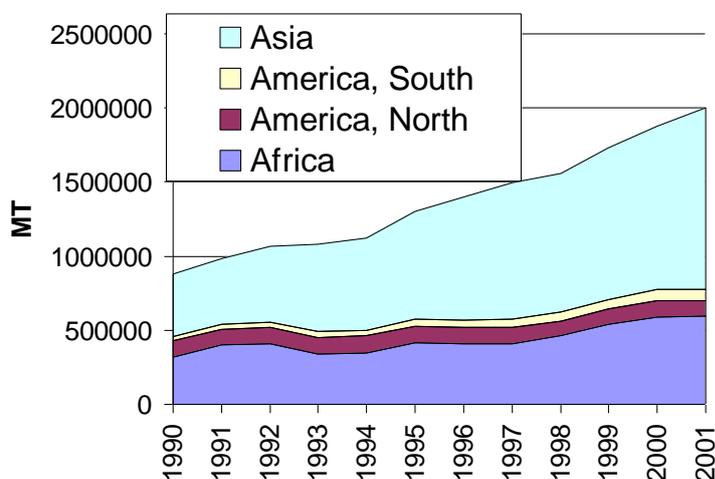
Table 2: Total tilapia production, by country – in 1000 MT

Country	1990	1992	1994	1996	1998	2000	2001
China	106	157	236	394	526	629	672
Egypt	25	115	121	153	181	289	298
Indonesia	63	70	80	92	84	83	86
Philippines	97	111	108	97	95	122	136
Thailand	51	85	119	120	113	123	140
Uganda	101	109	80	75	79	96	96
Others	388	371	326	398	417	540	578
TOTAL	831	1,017	1,070	1,358	1,518	1,882	2,006

Source: Fishstat+

Asia is the main region where tilapia is now produced and is also the main responsible for the spectacular growth experienced during the past decade. Asia accounts today for 60% of total tilapia production, while in 1990 this percentage was 50%. However, also Africa and South America have experienced a substantial increase in their tilapia output during the past decade.

Graph 4: Total tilapia production, by region – in MT



Source: Fishstat+

In the coming years, production in Asia will be booming, while Africa will relatively lose ground. South America, especially Brazil, will become major players among tilapia producing countries. In Latin America all the production comes from semi-intensive ponds.

Oreochromis niloticus or Nile tilapia is the most important species for both capture and aquaculture. This species can

grow up to 60 cm of length and to a weight of 3.6 kg. This species grows very fast, and is more and more replacing the second major species, *Oreochromis mossambicus* or Mozambique Tilapia in the aquaculture business. The latter species can reach 40 cm of length and a maximal weight of 3.2 kg. The third major species is *O. aureus* or blue tilapia. This species can grow to 30-35 cm with a weight of around 1.8 kg. This species is very salt tolerant.

Aquaculturists have been very successful in creating hybrids from the above and other minor tilapia species. It is tried to create the best tilapia, easy acceptable to the consumer, salt

tolerant – living in salty water increasing the tastiness of the tilapia – , quick growing with little animal protein intake.

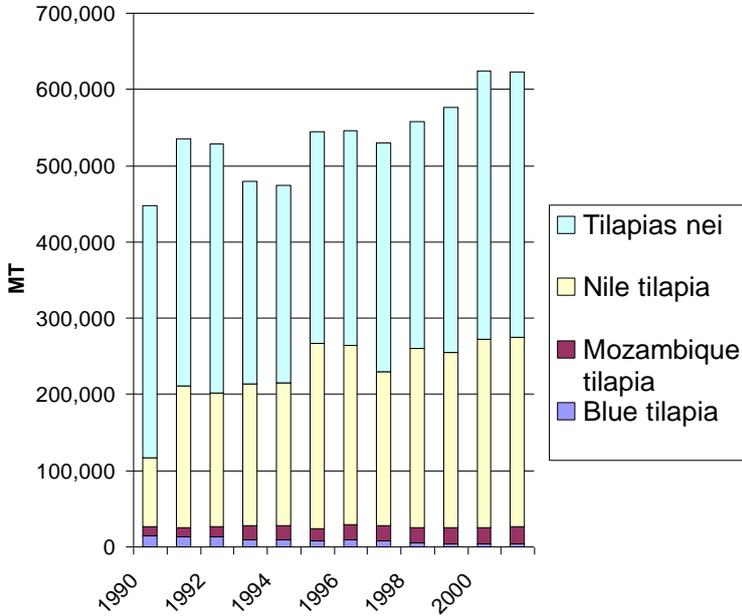
1.2 Capture

Table 3: Total tilapia capture, by species – in MT

Species	1990	1992	1994	1996	1998	2000	2001
Blue tilapia	15,077	13,887	9,681	9,704	5,210	4,500	4,500
Mozambique tilapia	11,761	12,059	17,647	19,285	20,598	21,400	22,000
Nile tilapia	90,058	175,770	188,227	235,740	235,119	245,900	248,000
Tilapias nei	330,488	327,184	258,700	281,287	296,649	353,000	348,000
TOTAL	447,384	528,900	474,255	546,016	557,576	624,800	622,500

Source: Fishstat+

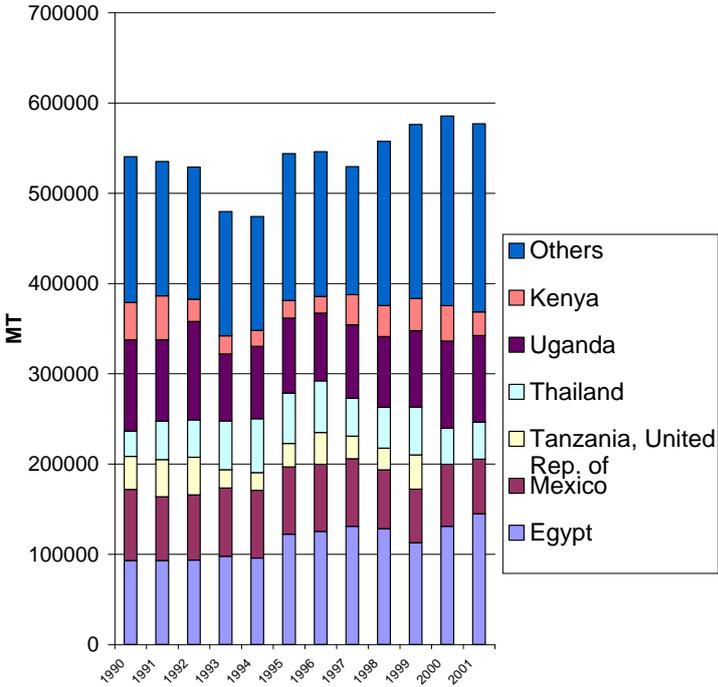
Graph 5: Total tilapia capture, by species – in MT



Source: Fishstat+

Total tilapia capture fisheries is about stable at 600 000 MT. Nile tilapia is the main identified species captured in the wild with 40% of total, however, in most of the tilapia catch the species is not identified. Blue tilapia seems to lose ground among the wild tilapia production while Mozambique tilapia stays stable.

Graph 6: Total tilapia wild production, by country – in MT



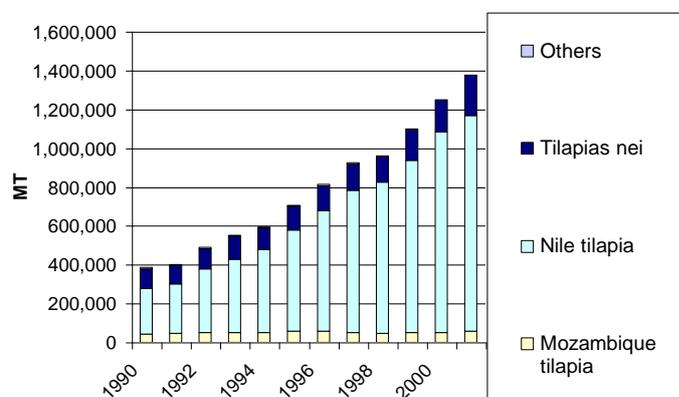
Egypt is the main tilapia capturing nation with over 100 000 M. In recent years, wild tilapia catches have gone down, as a result of environmental changes and a consequent reduction of the wild tilapia stock in the Nile. Uganda is also important tilapia catching country, where production is growing and getting close to the Egyptian output.

Overall, wild tilapia is mainly traded locally, and very little production enters international trade.

Source: Fishstat+

1.3 Aquaculture

Graph 7: Total tilapia aquaculture production, by species – in MT



Source: Fishstat+

Total tilapia aquaculture increased to reach almost 1.4 million MT in 2001, which compares to 400 000 MT a decade ago. By far the main species cultured is Nile tilapia, which makes up for about 80% of total species cultivated, and is the species responsible for the increase in production during the past years. Mozambique tilapia, the second major tilapia species produced in fish farms, is stable at 45 000 MT. Nile

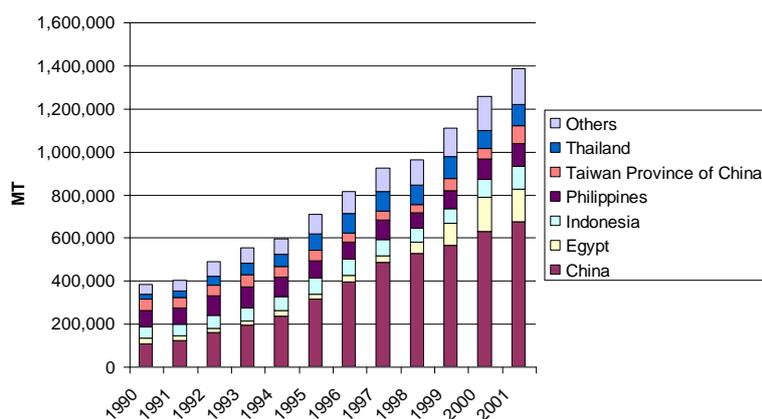
tilapia (*Oreochromis niloticus*) is already the ninth single species produced by the world aquaculture. In fact, as for the total weight produced, tilapia ranks after three molluscs (Pacific cupped oyster, Japanese carpet shell and Yesso scallop) and five carp species (silver carp, grass carp, common carp, bighead carp and crucian carp). Nile tilapia is more produced than any salmon, shrimp or mussel species.

Table 4: Total tilapia aquaculture production, by country – in 1000 MT

Country	1990	1992	1994	1996	1998	2000	2001
China	106	157	236	394	526	629	672
Egypt	25	22	25	28	53	157	152
Indonesia	54	60	64	75	66	85	105
Philippines	76	91	90	79	72	93	107
Taiwan PC	52	47	47	45	36	49	83
Thailand	23	44	60	91	91	83	98
Others	48	68	73	99	117	161	167
Total	384	488	596	812	960	1,257	1,384

Source: Fishstat+

Graph 8: Total tilapia aquaculture production, by country – in MT



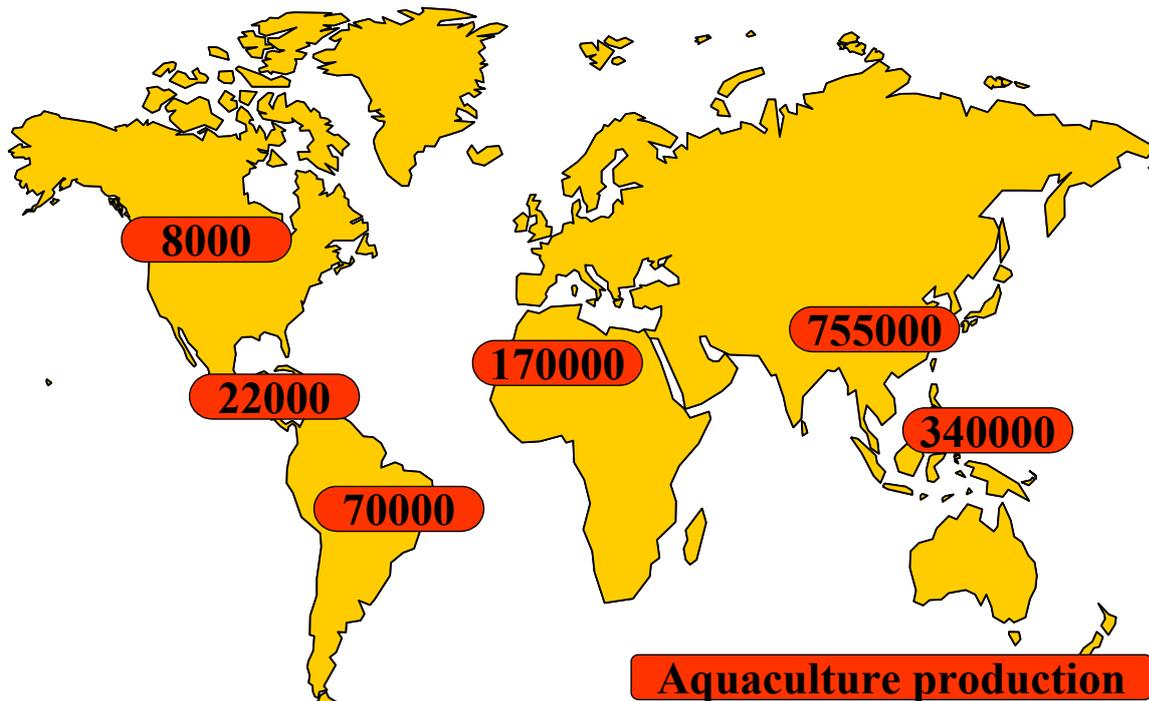
Source: Fishstat+

China is by far the main tilapia culturing country with production close to 700 000 MT. Egypt has been expanding its culturing industry in recent years and is now producing 150 000 MT. Taiwan Province of China – traditionally the world’s main exporter- produces about 80 000 MT of cultured tilapia per year. It has to be noticed, however, that many countries report higher

tilapia production than what is shown in this graph. One example is Brazil, where statistics show some 20 000 MT production, while some studies claim 50 000-60 000 MT of production. It is interesting to note that the six major producing countries produce about 95% of total tilapia production, but that more than 75 countries are culturing tilapia.

Asia is the main area where tilapia is cultured, representing over 70% of total production. The importance of Asia in total tilapia production will continue to grow very quickly. But tilapia production is also booming in Latin America, and to a lesser extent in Africa. Tilapia being an omnivore or herbivore and thus not necessarily dependent on fishmeal diets should be a good candidate for organic aquaculture production. This could open up new and higher value markets, especially in Europe. Organically raised shrimp fetches reportedly a 20% higher price in Europe than other cultured shrimp; something similar could be true for organic tilapia.

Graph 9: Tilapia Aquaculture production by continent – in MT



1.4 Future developments in major producing countries

1.4.1 Production systems

Tilapia aquaculture has advantages over other farming methods, especially in developing countries with a relatively low technical level

The initial investment to set up a tilapia farm is relatively low, much lower than for instance salmon farming

Tilapia production is not linked to any specific environment, pond culture as well as closed systems are viable

Tilapias are quite resistant with regard to disease

Tilapias are undemanding with regard to environment and feed

Tilapias multiply very quickly

Three methods of raising tilapia are identified:

Local small pond culture

Commercial small-scale systems Industrial aquaculture systems

Local small pond culture

These small ponds are working in an extensive way and are very common in tropical countries. This industry is providing protein to the local population. Quantity is the main trigger to development, quality comes last. Generally in the pond, all age classes are mixed. Feeding is very low and inexpensive (leftovers from kitchens). As a result the yield per hectare of this type of tilapia culture is very low at 0.5-2 MT.

Commercial small-scale systems

These systems are generally semi-intensive, prevailing in Asia. Tilapia is nowadays replacing carps in these type of systems. Fingerlings are regularly put into these systems, but the quality of the broodstock is not very high. Some feed is given (rice chaff, food leftovers). The commercial size of fish raised in this system is low at 250 g. These tilapias are targeting mainly the local market, but some exports occur.

Industrial aquaculture systems

These systems are intensive or highly intensive, with tilapia generally going into the international market. Regular stocking with high value broodstock occurs. Energy rich feed is given. Tilapias are only fished when they have reached a certain size. Marketing is often in live form, while fresh fillets are expanding their importance. Tilapia reaching the US or European market are mainly from this type of aquaculture system. The yield of industrial ponds can reach 15 MT, while recirculation systems allow 150-180 kg per cubic metre of water.

Biologists are experimenting various ways of increasing the yield from intensive farms. Genetically modified tilapias grow very fast, but the market acceptance is limited, at best. Hormone treatments, by which the number of males in the stock is increased and thus increase the size of the tilapia, are also used, but also in this case, the consumer shows resistance. Whole Food Markets, world's largest retailer of natural and organic foods, with 147 stores in North America, decided to stop buying tilapia in December 2003, because of hormone treatments to optimize harvest. Other supermarket chains might follow in the near future, even though the clientele of Whole Food Market is a special one, mainly directed towards consumers who are health conscious.

A more acceptable method is the so called Supermales. These supermales have two Y-chromosomes, in place of the normal X and Y, the offspring of these supermales give only males, so called genetically male tilapias (GMTs). These GMTs grow even faster than normal males.

1.4.1. Asia is the main producer

As already said, Asia accounts for about 75% of present tilapia production, and further increase of this share is likely. Apart from China (Mainland and Taiwan), South East Asia is

the most important producing area. The growing systems are relatively simple, and the costs of production are low. Thai production concentrates on *O. niloticus*, while Indonesia grows both *O. niloticus* and *O. mossambicus*. As shown in para. 1.3.1 the Philippines cultures a full range of species and modified tilapias. Total production by these three countries exceeded 300 000 MT in 2001, and further growth is likely.

1.4.1.1 Philippines

Philippines tilapia industry is growing fast, which has been attributed to significant government investment in the industry. Tilapia production increased from 92 500 MT in 2000 to 122 000 MT in 2002. Freshwater pond production accounted for 55% of total Philippines' production of tilapia in 2002, followed by freshwater cages (37%). Brackish water ponds represent 7% of total production. In fact, Cagayan Valley is becoming known as "tilapia country" because of the growth of the industry in this region the fish sufficiency level has grown from 21 per cent in 1999 to 40% in 2002. The farm beneficiaries produced 10.3 million quality fingerlings, with an income of PHP 1.9 million. Grow-out farms yielded 294,000 kgs of tilapia, worth PHP 13.5 million.

Over the past few years the government has made some significant contributions to the industry. In particular, the Department of Science and Technology (DOST), through its Consultancy on Agricultural Productivity Enhancement (CAPE) Program of the DOST-Technology Application and Promotion Institute (TAPI) and the Bureau of Fisheries and Aquatic Resources (BFAR), located in the Department of Agriculture. Because of a lack of technical knowledge, production rates at fish farms used to be quite low. Most operators relied on traditional methods for growing tilapia. The CAPE and DOST's S&T Expert Volunteers Poor Program (STEVPP) has provided much technical assistance and has also provided quality fingerlings to operators, training on latest techniques, endorsement of beneficiaries to train at the BFAR-National Freshwater Fisheries Technology Centre in Muñoz (Nueva Ecija), assistance in organising cooperatives and marketing of products for hatchery operators and beneficiaries, and the introduction of the sex reversed technology (SRT) tilapia to hatchery operation. Beneficiaries of the programme were then able to organize the only fishery cooperative in the region, the Cagayan Valley Fisherfolk Multi-Purpose Cooperative.

In May 2003, BFAR launched a genetically modified variety of tilapia, that is "larger, tastier and quicker to grow". It is hoped this new strain of tilapia will benefit the country's poor. Speaking ahead of the official launch of the new "genetically enhanced tilapia excellent strain" known as GET EXCEL, BFAR director Malcolm Sarmiento described the new "wonderfish" as the "product of genetic enhancement and cross-breeding" undertaken at BFAR research centres in the Science City of Muñoz in Nueva Ecija..

Since December 2002, President Arroyo has met with agriculture and fisheries officials and actively encouraged rice farmers to alternate between their crop and tilapia culture in order to boost tilapia output and lower prices. BFAR figures suggest that GET EXCEL could allow the government to do just that, because the new variety is 38.12 grams heavier for every 100 grams of the old varieties, resulting in "increased fish production and gross revenue for fish farmers." A BFAR report also states that "cost of production per kilogram can be substantially

reduced by raising the new variety, thus providing a cheap source of affordable animal protein for rural and urban consumers." Scientists in the international community have tested GET EXCEL in different environments such as fish cages and ponds. And according to Dr. Melchor Tayamen, head of the BFAR National Freshwater Fisheries Technology Centre, it "was proven to be 38% better than existing tilapia strains in terms of taste, yield and growth." There is immense potential for aquaculture in the Philippines, as it has 106,328 hectares of freshwater, 232,065 hectares of brackish water swamplands, as well as 14,531 hectares of freshwater and 239,000 hectares of brackish water fishponds.

Ex-pond prices of tilapia in the Pampanga, one of the main production areas fluctuates between P 38-45/kg, which is about US\$ 0.68-0.81/kg. The normal market size is a 200-250 g fish. Cost of production is higher for cage culture (US\$ 0.69-0.75/kg) than for pond culture (US\$ 0.58-0.60/kg). The wholesale price in Philippines is reported to be around US\$ 0.90-1.00/kg at present.

1.4.1.2 Malaysia

Under the Third National Agricultural Policy (NAP3) the Government of Malaysia has set a target to produce about 120 000 MT of tilapia by the year 2010. While the major share of this is expected to be consumed domestically, some would be processed into high value products for export markets. The country's tilapia production increased by 106% during 1995 -2002. In 2002, Malaysia harvested 18 277 MT of tilapia, mostly the high breed (Red Tilapia) variety.

1.4.1.3 Viet Nam

The authorities hope to produce 30 000 MT of African tilapia in 2003 with exports accounting for half this amount and earning up to US\$ 24 million. By 2010 they hope to be rearing 200 000 MT of the fish and exporting half to earn US\$ 160 million each year. Experiments in several provinces have shown that African tilapia adapt well to the local environment and are fairly resistant to disease. The species is suitable for intensive and semi-intensive farming in cages or rice fields and grows 30% faster than local species. This means that the southern provinces can have two fish harvests a year, whilst farmers in the north can raise them along with shrimp, crabs and other fish. Genetic modification has been used to produce only male fish, which weigh more and many provinces have already signed up to receive 625 000 fish produced by the aquaculture research institute. The institute has also worked in cooperation with Ho Chi Minh City's Agriculture and Forestry University to create training courses for improving fish quality. An agreement has also been signed with the Norwegian Government to improve fish breeding and research across the nation. The Norwegian Government will pay US\$ 2 million to help achieve this.

As tilapia fast becomes a favourite fish with consumers in the USA, Japan, southern Asian and Europe, the potential for Vietnamese production is opening up and with levels set to increase farmers believe their future looks very bright. According to the Ministry of Fisheries, production of tilapia in the 2002-2003 season is estimated at 120 000 to 150 000 MT, of which as much as 100 000 MT will be processed for export, earning between US\$ 100 and 120 million. The USA, which consumed 50 000 MT of processed tilapia in 2000, could be a promising market. Although only 12% of all tilapia consumed in the USA that year came from Viet Nam, producers believe they could easily increase exports. Japan offers exports

potential too as consumption of quality chilled and fresh fillets for sashimi is high, so does the EU, where tilapia could replace some whitefish. Tilapia, say producers, are easy to raise and can live in paddy fields and in cages in rivers and lakes. Feed for tilapia is easy to get and cheap to buy.

1.4.1.4 China

China is the biggest producer of tilapia, and production is still expanding. Most of the production is sold inside the country, but in recent years, China has become the main exporter to the US market. Chinese exports of tilapias jumped from just 473 MT in 1998 to 32 000 MT in 2002. The local authorities have officially announced the construction of a tilapia processing plant in Nanning city, Guangxi province, which should begin operating in June 2004. The CNY 50 million plant, will be jointly financed by Guangxi Zi Zhi Qu Marine Life Graduate School and the city of Nanning. It will be operated by Guangxi Nannng Jia Yang Food Co. Ltd. and will process 10 000 MT per year. Guangxi Nannng Jia Yang Food Co. Ltd. Acquired 6.67 hectares of land in a hi-tech industrial development area, where the company planned to build one of the highest-level factories in the entire Chinese territory.

It has been reported that the Chinese Ministry of Agriculture is particularly interested in promoting tilapia production this year because they consider this species to be one of the country's seven most important marine products. The city of Nanning is the biggest tilapia producer in the Guangxi province. By 2005 they expect to have a total farming area of 8 200 hectares and to produce 79 000 MT of tilapia worth CNY 500 million.

1.4.1.5 Sri Lanka

The National Aquaculture Development Authority (NAQDA) plans to culture red tilapia and tap into the large USA market. NAQDA said the project to farm the tilapia in cages will be made possible with US\$ 3.5 million from an unnamed Malaysian company, which is a leading exporter of red tilapia with a lot of experience in its culture. The project could create 500 new jobs. At present, most of tilapia available in Sri Lanka is locally consumed and since there has been no commercial rearing export markets could not be tapped. If the cage culture project is a success it would encourage shrimp exporters to diversify and culture both shrimp and tilapia.

1.4.2. Africa could do better

Tilapia originates in Africa, but production is very limited. In 2001 total African production was 300 000 MT, a strong growth over the 115 000 MT reported in 1999. The bulk of this increase and the bulk of the production is concentrated in Egypt. This country accounts for 90% of total African cultured tilapia production.

1.4.2.1. Kenya

Moi University now boasts of the largest teaching and research fish farm in East Africa. As part of its mission in out-reach, the University recognised that development in fish farming in this part of the world was in dire need for locally proven methods in aquaculture for use in extension. Through local resources and World Bank support for Lake Victoria Environment Management Programme, the Department of Fisheries of Moi University has constructed 37 ponds covering a total area of 2.5 hectares. The ponds comprise twenty-five 100 m² for research, six 300m² for breeding and holding, four-1000 m² production and two half-acre ponds (2025 m²) for grow-out and recreation. Supplying the ponds with water is a spring-fed three -acre dam. On completion, the farm will have a state of the art hatchery, forty fishponds, fish tanks and raceways. Tilapia, catfish, trout and ornamental carp will be reared on the farm.

1.4.2.2. Zimbabwe

Lake Harvest, which farms and processes tilapia in northern Zimbabwe, is increasing its exports of fresh and frozen fillets to European markets. Lake Harvest farms Nile tilapia (*Oreochromis niloticus*) using floating net pens in Lake Kariba, northern Zimbabwe. It is currently producing 3 000 MT of whole fish annually and plans to expand this production to 5 000 MT per annum by 2005. The water quality in Lake Kariba is exceptionally good and fish feed is manufactured on site. The internationally-owned company processes its fish from live in a new purpose built factory in Kariba Town and exports fresh (chilled) and frozen fillets, mainly to Europe through its sales and marketing company, Lake Harvest International (Luxembourg). It supplies super-markets, restaurant chains and food service businesses, either directly or through selected distributors. Fish are traceable from the time they were hatched, and this is a very important feature for customers. The fish are harvested year round from the net cages at an average weight of 900 g -it takes about 16 months from the egg to reach this weight. They are then transported live to Lake Harvest's factory on the shores of Lake Kariba for processing.

1.4.3. Latin American tilapia production is growing fast

The biggest growth rates in tilapia culture are reported at the moment by central and south American producers. In recent years, these producers managed to catch huge shares in the US market, and further expansion is forecast. The white spot disease in shrimp ponds of Latin American countries, first among all in Ecuador, created good conditions for tilapia culture in these ponds.

1.4.3.1. Brazil

In 2003, tilapia production in Brazil could reach 86 400 MT, which could generate US\$ 50 million in revenue. Although there is not much statistical information available about this sector as small-scale farmers dominate the industry, it is believed that 52% of the total production is concentrated in the south, and 24% on the north-east. In the Sao Francisco river area, the tilapia industry is booming, with new ponds about to be opened. Federal state governments have invested money in creating farms for the poor and displaced. 1 000 families

will become owner of a 4 ha tilapia farm each. Farmed tilapia from the northeast region is gaining ground in R o de Janeiro's seafood restaurants and, at the same time, it is already found on 70% of Pernambuco's supermarket shelves, reports Mercado da Pesca. Some 400 producers in Pernambuco state are farming tilapia, encouraged by its high productivity rates and profitability. According to the fisheries director of Pernambuco's Rural Production and Agriculture Reform Secretariat, Roberto Maur cio Batista, aquaculture farmers can recover their investments in one and a half years in the case of land-based ponds, and in just one year when they use river cages, such as in Bah a state's San Francisco River.

There is a great demand for tilapia, on both the domestic and the international market. Pernambuco is the main domestic market and the US is the main export market. One of the most common species in Brazil is Thai tilapia, which was introduced in the country in 1966. This fish reaches sexual maturity between three and six months after the fattening stage has started. Therefore, there can be two or three harvests per year. A wide variety of feed can be used for tilapia including vegetables, such as grass, leaves, aquatic plants, fruits and unicellular algae, and animals, such as crustaceans, larvae, worms, molluscs, amphibians and fish. The increasing interest in tilapia farming can be attributed to the progress made in fingerling production and also to a good trade network for the final product, which is available as whole, gutted, as fillet and smoked. The forecast for 2010 talks about 420 000 MT.

1.4.3.2. Costa Rica

The world's biggest tilapia farm is based in Costa Rica, Aqua Corporacion Internacional, which produces about 5 000 MT of tilapia per year, with an increase to 8 000 MT in the near future. In average, the fish is already 40 minutes after catch ready for transport, mainly by plane to the US market. The main products are fresh fillets.

Costa Rica became a major supplier of farmed tilapia to the USA in the late nineties , according to the Fisheries and Aquaculture Institute (Incopescas). Incopesca's statistics indicate that tilapia exports to the US reached US\$ 22.3 million during 2003, a considerable increase from the previous year's US\$ 18.6 million, reports La Prensa. Incopesca analysts say catches and exports of tilapia have grown in a sustainable way throughout the last few years. This increase has benefited around 1 100 coastal fishermen who earn their living from this activity. Information also suggests that this is the country's most farmed species with 72% of fish farms producing tilapia, 19% farming trout, and 8% producing prawn. The remaining 1% of the industry is dedicated to farming species such as clam and shrimp. Experts have also observed that this activity has developed considerably over the past 10 years, mostly due to the country's ideal geographical conditions.

The government is looking to countries with plenty of aquaculture experience - such as Spain - for support. At present there are 700 small and medium-scale tilapia producers in Costa Rica. Tilapia exports have grown from CRC 8 858 million in 2001 to CRC 9 620 million during the first half of 2002 alone. Costa Rica has become one of the main suppliers of farmed tilapia to the USA, according to the Fisheries and Aquaculture Institute (Incopescas).

1.4.3.3. Ecuador

Although tilapia farming got off to a slow start in Ecuador a few years ago, its production and consumption is currently booming - the country has become the main Latin American supplier to the USA. According to a recent article, tilapia farming in Ecuador started 30 years ago as a non-professional and non-technical activity and has grown from 10 MT that were exported in 1993 to 7 500 MT sold in 2002. A few years ago, businessmen that ventured into tilapia farming were not very convinced about the merits of the business. There are no exact figures available, but it is estimated that Ecuador produced over 25 000 MT of tilapia in 2002. Ecuador's exporters received US\$ 40.24 million for this. The remaining US\$ 1.2 million were sold as frozen fillets and only to the USA. Based on the volume the US imports, Ecuador has become the top Latin American supplier of that market followed by Honduras and Costa Rica that are a long way behind. Tilapia production is expected to increase by 300% in 2004 thanks to the extensive infrastructure and appropriate technology that are now available. One of the most comprehensive processing plants in Latin America is already operating to the south of Guayaquil. The Aqualab plant has automated systems, computerised control, refrigerated areas and packaging rooms. The company is developing a popular range of value added products, such as breaded nuggets and fillets, marinated fillets, and surimi, all them presented in polybags of less than 1 kg.

Supermarkets in Ecuador's capital Quito sell a pound of tilapia fillet for US\$ 2 to US\$ 3.60. To get this fillet weight three pounds of unprocessed fish are needed. In turn, a kilo of unprocessed fish fetches US\$ 1 to US\$ 1.5 in the market. The price is US\$ 60 cents a pound at the Port of Guayaquil on Ecuador's coast and closer to the production area. In Miami this goes up to US\$ 2.6 for distributors. The final consumer pays an average of US\$ 5.99. In the former shrimp farms, the costs of producing a tonne of tilapia range from US\$ 600 to US\$ 750. 70% is invested in feed. The red tilapia variety can be farmed in combination with other autochthonous species like snook and even shrimps. Tilapia grows well at 22° Celsius. It requires clean and well oxygenated water. For it to grow more quickly at the farms, only males are used to avoid mating.

A US\$ 5 million loan granted in mid 2002 by the Inter-American bank to the largest processing plant in Ecuador will be used to improve facilities and equipment. The upgrading is in turn expected to give new momentum to exports of frozen tilapia from the country. With the collapse of the shrimp industry due to viral disease, many shrimp farmers have shifted to tilapia breeding. According to some reports, Ecuador has already become the leading tilapia producer in the region, overtaking Costa Rica and Panama. Ecuadorian exporters believe they can easily exceed the 7 500 MT sold in 2002 for US\$ 41.5 million. There are around 30 000 hectares of tilapia ponds in the Taura area of Guayas province and 95% of the harvest is exported to the US market, with the rest going to Colombia and the domestic market. According to National Aquaculture Chamber sources, production in the provinces of Guayas, Manabi and Esmeraldas easily reaches 25 000 MT annually. Small producers in Ecuador have begun production with around 300 or 500 fish and an investment of no more than US\$ 2 000, and have ended up being able to reinvest US\$ 25 000 in the process thanks to high exports.

1.4.3.4. Peru

Production of tilapia in Peru is rather small, as the introduction of tilapia was made subject to restrictions in 1992. At the end of 1999, only 250 MT were produced. Since 2000, shrimp pond owners struck with the white spot disease were allowed to raise tilapia. Also larger companies started to invest in tilapia farms, and the production for 2002 was estimated at 2000 MT.

1.4.4. Other regions

1.4.4.1. USA

US production of farmed tilapia reached a record in 1998 with 8 250 MT which represented an increase of 8%, compared to the reported production in 1997. Tilapia production in the US has increased significantly every year since 1991, at an annual average rate of 20 %. In 1998 local production (live weight) was as follows: Western Region, about 3,180 MT; Northern-Central Region, about 1 723 MT; Northeast Region, about 1 592 MT; Southern Region, about 1 575 MT; and the Tropical Region, about 180 MT. Since 1998 US production volumes remained stable compared to last years', although the production achieved per region varied, experiencing increases in the North Central and Southern areas of the country. With the closure of the nation's largest tilapia facility, Solar Aquafarms of California, production in the Western Region declined sharply.

1.4.4.2. Europe

Europe is with 300 MT without influence on world production. The main production is done in Belgium, through the Gabriel group. Some tilapia is also produced in France. Production costs are too high in Europe to be able to compete with products coming from tropical countries.

2. Products, exporters and markets

2.1 Product forms

The tilapia meat is typically white, although the red skinned tilapia may have a reddish tint to the meat. Cooked meat is opaque. A brown coloured meat will result from red-skinned fish if the tilapia is not skinned deeply enough. The firm, flaky texture of tilapia has a sweet, mild flavour. Tilapia can easily substituted in recipes for sole, snapper, pompano, flounder, cod, seabass, and Orange roughy.

Tilapia absorbs flavour from the water it is raised in, so the source of supply is very important. Shelf-life for fresh tilapia at 0° Celsius is two weeks. Shelf-life for frozen product is 6 months. Blast frozen or block frozen is a sign of a poor product.

Tilapia can be broiled, fried, grilled, baked, poached, sautéed, or steamed. Tilapia's attractive skin may be displayed, especially when it is the red tilapia, but should not be eaten due to a bitter taste. The most common ways in which these commodities are traded are: live, fresh whole (gutted), whole frozen (gutted), fresh and frozen fillets (skin-on, and skinless). Frozen whole tilapia is basically a round fish of 300-500 g. Its attractive price makes tilapia an interesting fish for catering services.

In the countries of production, tilapia is mainly sold in whole form, in the main importing countries, the main product form is fillets. Increasingly important are fresh fillets, while value added products or convenience food are still small in quantity.

Table 5: Average value (US\$/kg) of various tilapia species

Year	Oreochromis mossambicus	Oreochromis niloticus	Oreochromis aureus	Oreochromis andersonii	Others
1989	2.00	1.30	0.83	1.00	1.31
1990	2.09	1.37	0.83	1.00	1.33
1991	2.12	1.32	0.87	1.25	1.32
1992	2.17	1.34	0.84	1.50	1.69
1993	2.14	1.30	0.83	2.00	1.55
1994	2.15	1.26	0.75	2.75	1.76
1995	2.11	1.19	0.76	3.54	2.14
1996	2.13	1.19	0.75	4.20	2.21
1997	2.16	1.19	0.88	3.00	2.10
1998	2.07	1.23	1.55	1.62	2.19
1999	2.12	1.23	1.21	1.60	1.94
2000	2.03	1.27	1.54	1.65	2.26
2001	2.00	1.30	1.58	1.65	2.07
Average	2.10	1.27	1.02	2.08	1.84

Source: calculation based on FAO FISHSTAT - aquaculture production volume and value.

Average value of tilapia products is US\$ 1.45/kg (2001 value). Mozambique tilapia ex farm price is generally higher than the world average value of tilapia, with US\$ 2.10/kg in average. On the other hand, Nile tilapia normally is based on the lower end of the value scale with US\$ 1.27/kg.

The frozen fillets category is exported by Latin American countries and is known as “standard high-quality”. There are fillets from fish that have been grown in favourable conditions and/or purged in clean water before harvesting, and are well trimmed, are graded into 57-86 g, 86-143 g, and 143-200 g, and are blast frozen or IQF. This category is sold not only to the U.S. but also to the European markets. This is the highest growing segment and the consumers are becoming very familiar with this product type. Fresh fillets are another very high quality product. This category typically commands higher prices than frozen fillets, although in recent years the price difference has narrowed. However, it must be remembered that fresh fillets are a more perishable product than frozen fillets. Also, US consumers typically prefer a white fillet, so the bloodline is often removed during processing.

China is increasingly exporting fillets that are treated with carbon monoxide or tasteless smoke in order to improve their appearance before freezing. The fillets thus get a reddish colour, better liked in the markets.

Taiwan Province of China lost ground on the US market, but managed to expand its market in Japan and the Republic of Korea with high value sashimi tilapia. Thus, the island has increased the income from tilapia farming despite a substantial decline in production during recent years.

Wholesale and retail prices have stabilized significantly in both the wholesale and the retail markets. In this regard, consolidated companies are allocating great amounts of financial and technological resources to the development of new forms in which tilapia products are penetrating the US market. These new products include breaded fillets and nuggets, marinated fillets, and IQF in 1 and 2 pound polybags. A prominent tilapia-producing company in Costa Rica, which dominates the exports of fresh fillets to the US, has introduced a new line of marinated tilapia products, which are being increasingly used by restaurants and supermarkets, although still at a relatively small scale. Another company based in Florida which holds the largest market share in the frozen fillet segment in the US (their plant in Indonesia produces about 4 500 MT), also markets breaded fillets.

Surimi is another example of the new products that could be created by transforming and adding value to tilapia primary products. Surimi is a fish based product which imitates in shape, texture and taste popular and massively consumed marine products, such as crabs, lobsters, scallops and others. Tilapia pulp is well positioned to capture these market shortages for a white, mild tasting fish, and experimental food development techniques are being implemented to manufacture high quality massive consumption products based on tilapia pulp, such as breaded and formatted sticks and nuggets. The strategy is to process “minced parts” of the tilapia. In addition, at pond harvest a number of smaller fish (<250 g) will be used to increase the capacity of raw material (up to 57% as pulp) to manufacture these analogous products.

In many tilapia producing countries, such as the Philippines, there is no processing of tilapia. Fish are sold whole, round, either fresh or chilled on ice in wholesale or provincial markets. Recently, individual small scale retailers have started to sell live fish in shallow tanks in rural

markets. In other countries, such as Thailand, there is limited processing for local markets, either as gutted fish or occasionally fillet. The major processing effort is for the exporting industry, mainly as IQF fillets. In order to make processing cost effective and profitable it is necessary to identify reliable local markets for the by-products, including head, viscera, carcass and skin.

Fillet yield of tilapia is very small, at 30-33%. For some fillets sold as deep-skinned, the yield can even decline further to 28%. The deep skinning takes off the fat layer, which makes the appearance of the fillets unappetizing. Normal sizes for fillets are 100-150 g, 150-200 g and over 200 g (for the European market). For the whole tilapia, European traders sell 400-600 g, 600-800 g and over 800 g sizes.

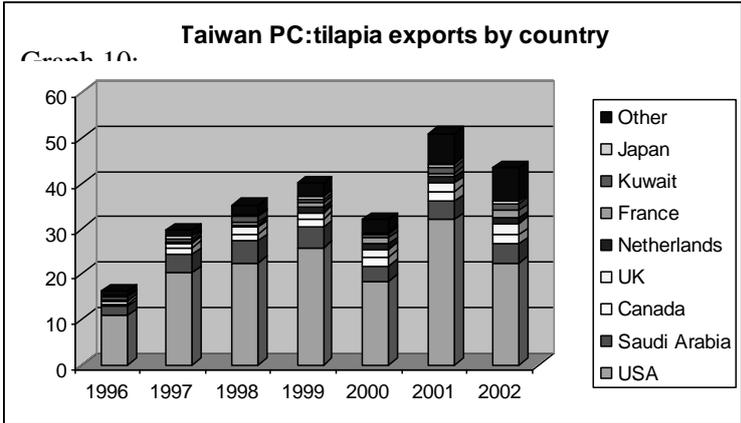
Convenience products offered are less important. Some breaded fillets are on offer in the USA, some deboned tilapia fillets from Jamaica Pride. Another US company offers tilapia dipped in coco mix and tequila batter, with coconut breading, and other exotic battering. Some tilapia burgers are offered in Costa Rica. In the Philippines the industry will prepare some nuggets and some traditional fish products using tilapia.

2.2 International trade

2.2.1. Exports

2.2.1.1. Taiwan Province of China

Taiwan Province of China is traditionally the main exporter of tilapia, only in very recent years, it has been replaced by China Mainland. Taiwanese Province of China exports reflect a certain moving of production capacity for tilapia from the island to the Mainland.

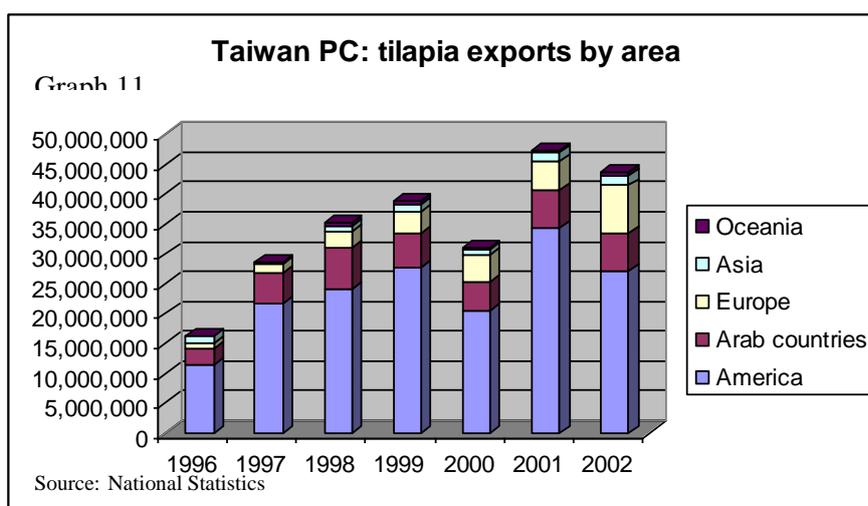


Source: National Statistics

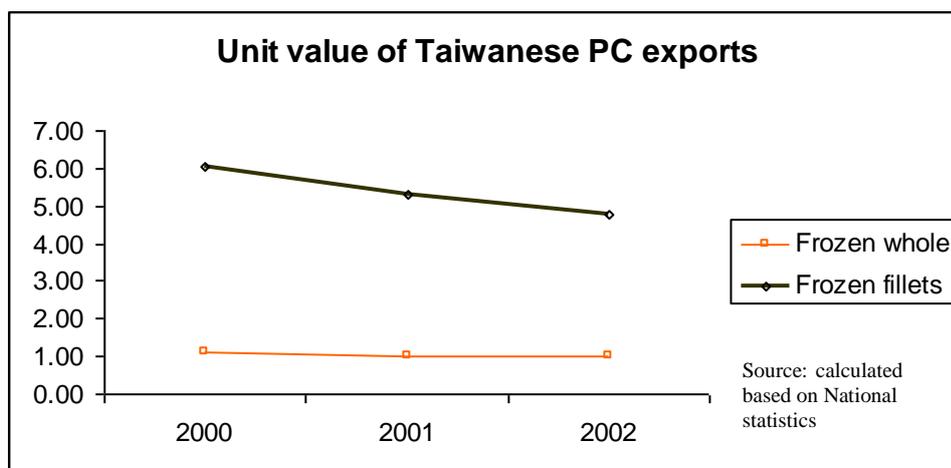
Province of China exports mainly whole frozen tilapia. Exports of all tilapia products from the island reached a peak of 50 000 MT in 2001, to decline to only 43 400 MT in the following year. The main importing country of tilapia from Taiwan Province of China is the USA with more than half of the exports. Saudi Arabia is the second major importer with about 4 000 MT. Canada is also a relatively important market for tilapia from the islands. UK is an

expanding market which imported 2 400 MT from Taiwan Province of China, which is four-times the 1997 amount.

The graph for the regional distribution of tilapia from Taiwan Province of China confirms that the Americas are the main market for this product. The Arab region is also relatively strong, as in addition to Saudi Arabia also other Gulf countries are importing important quantities of tilapia. While their imports are stable, Europe is expanding, indicating that tilapia is slowly finding a market in this important consumption area. It should be noted that the two graphs do not correspond in the total as there are several countries listed under “other” where it is impossible to find out which region they are belonging to.



The unit value of Taiwanese Province of China tilapia exports reflects the overall price decline of tilapia on the world market.



Frozen tilapia fillets had an export value of US\$ 6.00/kg in 2000, to go down to US\$ 4.80/kg in 2002. The whole tilapia unit value also went down, even though only marginal and is now stable at

about US\$ 1.00/kg.

2.2.1.2. China

China is not statistically reporting its tilapia exports, so the analysis has to be based on import statistics by main clients for Chinese tilapia. These import statistics show that the role of China Mainland as tilapia exports has grown strongly in 2002 and 2003. In 2002, Chinese exports of tilapia can be estimated at 30 000 MT. In 2003, this figure is likely to have

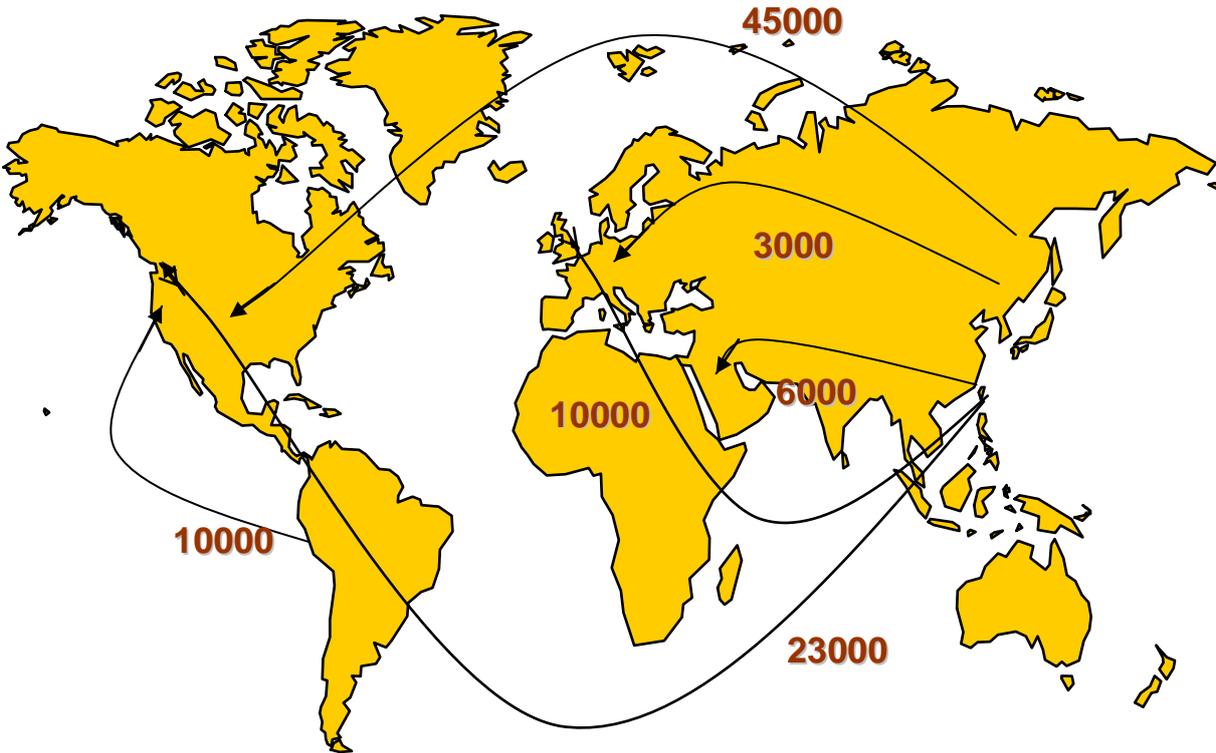
exceeded 45 000 MT. China is exporting almost exclusively frozen whole tilapia, at the lower end of the price scale.

2.2.1.3. Ecuador

Ecuador has become the main producer of tilapia in Latin America, and is also the main exporting country. After a promising start in the European market, the country has reverted all its attention to the US market, by exporting mainly fresh tilapia fillets. In 2003, total Ecuadorian exports of tilapia can be estimated at 10 000 MT, which compares to about 8 000 MT in 2002. In value terms, Ecuadorian tilapia exports represent about US\$ 55 million, which starts to be an important figure, even though it is still far below the value of shrimp exports (US\$ 800 million in pre white head disease times).

Costa Rica used to be the main exporting country of tilapia from Latin America, also concentrating on fresh tilapia. However, in recent years, the country lost ground in favour of Ecuador. The 2003 exports can be estimated at 3 800 MT.

Graph 13: World exports flows of tilapia products – 2003 – in MT



Source: Author’s calculation based on national statistics

Comparing the trade flows with the aquaculture production, several issues become evident:

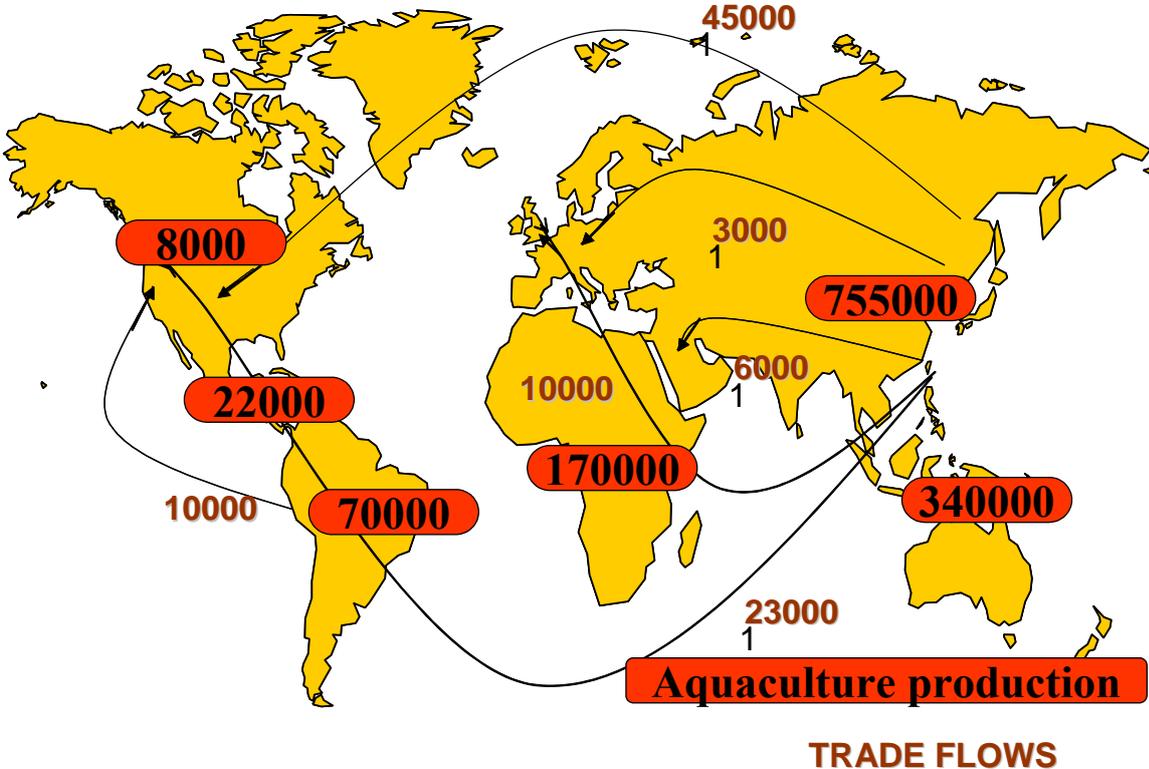
The main producing country: China (Mainland and Taiwan Province) are also the main exporters, but a substantial quantity of the total production stays in the country

South East Asia is a main producer, but not yet a major exporter, again this means that most of the production is used for domestic consumption.

Something similar is true for Africa, where 99% of the production stays inside the region

On the contrary, Central and Southern American production are interested in export marketing mainly to USA and Canada.

Graph 14: Comparison production and trade flows



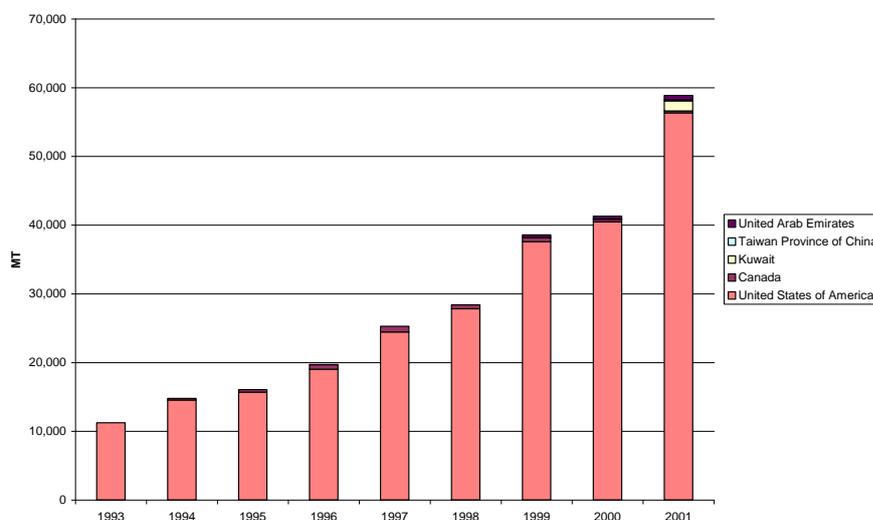
Source: Author's calculation based on national statistics

2.2.2. Imports

Unfortunately, it is not possible to obtain an overall and exhaustive picture of the tilapia world markets, as no global world trade figures are available. Tilapia is not identified as a separate commodity item by the great part of the country's statistics and tilapias are entered together with many other freshwater species. Yet, international tilapia trade seems to be rather negligible compared to the domestic production and usage. The bulk of the production is still consumed locally. China is by far the main consuming country for tilapia.

In the official FAO trade statistics only very few exporting countries are identified, with Taiwan Province of China as main supplier. Taiwan Province of China has increased its exports of tilapia remarkably since 1996, the first year in which tilapia was identified as a separate item in the yearbook of this country. In 1999, Taiwan Province of China exported nearly 40 000 MT, 71% of which were directed to the American countries, the USA in particular, 15% to the Arab countries, 10% to Europe and smaller quantities to Asia and Oceania. Exports of tilapia to Asia are generally directed to Japan and the Republic of Korea for use as sashimi.

Graph 14: Tilapia imports – by countries – in MT



This graph shows the only data available on tilapia in the FAO FIDI database. Practically the only big market identified is the USA and many importing countries are missing. Europe represents a market with considerable potential, but to date there has been limited penetration of this market.

The bulk of the imports is in frozen form, with an increase of the imports of fresh and frozen fillets in the last few years. This obviously reflects the trend of the US tilapia imports.

2.2.2.1. USA

Tilapia imports into the USA continue to show strong growth as demand and consumption of the mild white fish skyrockets in the United States. California is the most frequent route used by Asian countries for their tilapia exports. Los Angeles and San Francisco are the cities with the largest concentration of Asian populations.

Table 6: US total tilapia import – by country (in MT)

	1997	1998	1999	2000	2001	2002	2003 (J-N)
China	52	473	5,728	13,492	13,590	26,486	41,360
Taiwan PC	19,491	22,415	24,966	17,729	29,809	23,667	20,807
Ecuador	881	757	2,012	3,447	5,159	6,903	8,922
Costa Rica	1,673	2,210	2,310	2,684	3,109	3,208	3,702
Indonesia	1,095	885	1,146	1,221	2,218	2,575	3,381
Honduras	212	506	792	1,046	1,438	2,874	2,611
Thailand	228	173	162	198	260	615	988
Brazil	1	0	0	2	8	161	223
Panama	63	4	20	161	353	345	219
Others	748	398	439	489	395	353	592
Grand Total	24,444	27,820	37,575	40,469	56,337	67,187	82,805

Source: national statistics

Total tilapia imports into the USA reached 82 800 MT in 2003 (first eleven months only), which is more than three times the import quantity of just seven years ago. The other important issue is that at present China Mainland is the main exporter to the US market accounting for about half of the market, while Taiwan Province of China lost its position. It is well known that the Chinese Mainland tilapia production going to export market was initiated with the know-how and the capital from the Taiwanese island, taking advantage of the lower labour costs, but also of wider production areas available on the Mainland.

All other exporters to US market show an important growth, but all together do not account for more than one fourth of the US market. It is interesting to note the position of Brazil, emerging from almost nothing two years ago to eighth position among the tilapia exporters to the US market. Further growth is likely, as the CFC/INFOPECA project will help to produce and export new value-added products.

Table 7: US total tilapia import – by product form (in MT)

	1997	1998	1999	2000	2001	2002	2003 (J-N)
Whole Frozen	19,122	21,534	27,293	27,781	38,730	40,748	45,315
Frozen fillets	2,499	2,696	4,971	5,186	7,372	12,253	21,082
Fresh fillets	2,823	3,590	5,310	7,502	10,236	14,187	16,409
TOTAL	24,444	27,820	37,575	40,469	56,337	67,187	82,805

Source: national statistics

While frozen whole fish remain the biggest segment of imports at 57 percent, fresh and frozen fillets continue to boast the highest growth rates. Total imports of fresh fillets increased 26 percent to 16 500 MT¹, while imports of frozen fillets rose doubled to 21 000 MT.

¹ The comparisons in this paragraph are between January-November 2003 (the latest data available when writing the report) and January-November 2002, not shown in the table.

Table 8: US frozen tilapia import – by country of origin (in MT)

	1997	1998	1999	2000	2001	2002	2003 (J-N)
China	52	435	4,940	11,622	10,870	19,616	26,450
Taiwan PC	18,640	20,995	22,055	15,916	27,599	20,660	18,317
Ecuador	171	31	149	24	95	16	124
Hong Kong	0	0	0	52	0	40	117
Thailand	4	35	47	20	49	250	104
Panama	2	0	0	2	2	150	92
Others	254	37	101	145	114	17	110
Grand Total	19,122	21,534	27,293	27,781	38,730	40,748	45,315

Source: national statistics

The biggest exporters of whole fish imports were Taiwan Province of China and China, which account for virtually all frozen whole tilapia imports. However, China is rapidly becoming the dominant player in the important frozen tilapia sector. In fact in 2003, China overtook Taiwan Province of China, and is now accounting for 60% of total supply of whole frozen tilapia to the US market.

Table 9: US fresh tilapia fillets import – by country of origin (in MT)

	1997	1998	1999	2000	2001	2002	2003 (J-N)
Ecuador	602	646	1,806	3,253	4,924	6,616	8,621
Costa Rica	1,656	2,206	2,310	2,684	3,109	3,206	3,698
Honduras	164	436	771	1,038	1,438	2,874	2,611
China	0	0	38	59	191	844	712
Taiwan PC	8	85	155	82	76	247	247
Brazil	1	0	0	2	0	112	196
El Salvador	0	0	0	0	0	78	172
Panama	61	4	20	159	350	147	88
others	331	213	209	225	148	64	63
Grand Total	2,823	3,590	5,310	7,502	10,236	14,187	16,409

Source: national statistics

Latin America is the main fresh fillet exporter to the US market, this does not come as a surprise given the relative geographical advantage over Asian exporters. The key exporters are Ecuador, Costa Rica and Honduras. However, Ecuador is quickly becoming the biggest exporter, shipping 8 600 MT of fresh fillets - up 30 percent from 2002 - in the first even months of 2003 and accounting for about half of all fresh fillet imports into the USA. It has to be seen whether Ecuador can keep or even expand this position, given that producers are shifting back to shrimp culture. Costa Rica, the pioneer in the continent in regard to exports of high quality fresh fillets made from tilapia, is growing, but losing out to Ecuador. Again, a special reference to Brazil, which is growing its fresh fillet exports, but the rate of growth seems to have slowed down in 2003.

Table 10: US frozen tilapia fillets import – by country of origin (in MT)

	1997	1998	1999	2000	2001	2002	2003 (J-N)
China	0	38	749	1,810	2,529	6,026	14,198
Indonesia	1,095	885	1,146	1,218	2,179	2,572	3,375
Taiwan PC	842	1,334	2,756	1,730	2,133	2,761	2,242
Thailand	224	138	115	178	209	338	883
Ecuador	108	80	56	170	140	272	177
Viet Nam	0	0	1	18	53	106	73
Panama	0	0	0	0	0	48	39
Brazil	0	0	0	0	8	49	27
Others	229	221	147	60	121	79	68
Grand Total	2,499	2,696	4,971	5,186	7,372	12,253	21,082

Source: national statistics

The USDA notes, though, that the most promising sector in terms of growth will be frozen fillets. Imports of this product doubled in the first eleven months of 2003 over last year, with the bulk of the increase coming from China. The Asian country has boosted its shipments to 14 200 MT this year - more than twice the combined shipments of Indonesia and Taiwan Province of China and almost two thirds the shipments of all frozen fillet imports. All other players are relatively unimportant.

Table 11: Main sources of US tilapia products

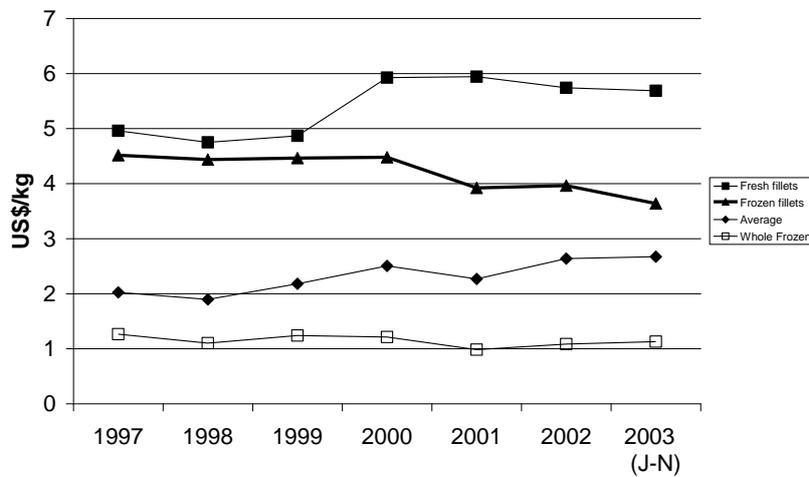
Live	USA
Fresh, whole	USA
Fresh, fillets	Central and South America
Frozen, whole	Asia
Frozen, fillets	Asia
Value added	Central and South America

Source: Author's estimates based on national statistics and industry contacts

Meanwhile, the strong increases in tilapia imports have driven the prices down. The average unit price for frozen whole tilapia in the first half of 2003 was US\$ 0.52/lb, up three cents over 2002 but below 2000 prices. The average price of fresh tilapia was US\$2.58 per pound, down 11 cents from 2002. Likewise, the average price for frozen fillets fell 7 cents to US\$1.73 a pound.

However, when combined, the value of all tilapia imports into the USA rose to US\$ 221 million in the first eleven months of 2003. By the end of this year, total shipments are expected to reach between 100 000 and 105 000 MT (on a product-weight basis) with a value of exceeding US\$ 250 million.

Graph 15: Unit value of US tilapia imports



Source: Author's calculation based on national statistics

The graph shows that the unit value of fresh fillets has stayed stable, despite the increase in imports. In 2003, this value was US\$ 5.68/kg. On the other hand the unit value of frozen fillets has gone down, due to higher imports. The total values (frozen whole and frozen fillets) are so close together now (less than three times the whole fish price), that in theory the production of frozen fillets

is becoming uneconomical. The constant increase of whole tilapia unit values is probably the most important feature to be observed. Sashimi tilapia is likely to play a role here. In 2003, the unit value of whole tilapia went up to US\$ 1.20/kg. One has to take into account when watching the relative increase in unit value that during that year the US dollar devaluated strongly against the Euro and the Japanese Yen.

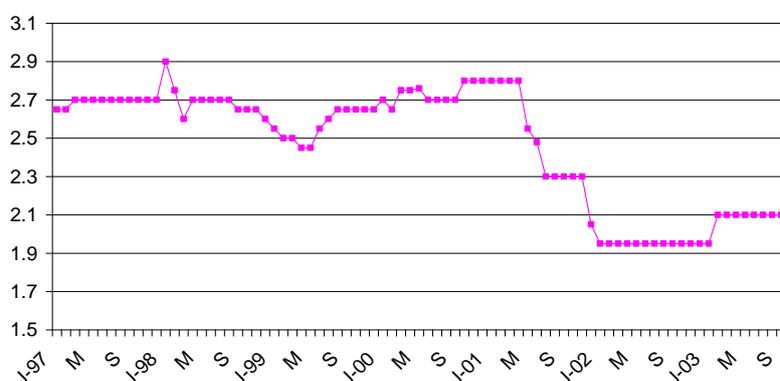
The Tilapia Marketing Institute (TMI) should provide a further boost to demand in the USA. TMI was founded in 1998 and funded (US\$ 250 000) by several large producers and marketers with the goal of increasing awareness and demand for tilapia products (TMI 1999). TMI has nine producer members and one member from the packaging industry. The TMI strategy is to position tilapia by identifying its most favourable attributes and matching these to the needs of a target market. It expects to accomplish this by working closely with food journalists to prepare informative stories reporting on tilapia and its place in the seafood market. A series of strategic messages will be developed which will be highlighted to create a strong image of tilapia with consumers. Several themes will then be presented to the food press to reinforce and diversify the basic message about tilapia.

Key positioning statements, phraseology and themes have been proposed and are under consideration by the TMI members. TMI's generic campaign will be designed to benefit all tilapia producers and product forms. No differentiation will be made between US and foreign products. However, all producers will be under pressure to insure that only the highest quality products would be offered to the market. With a generic campaign, all producers suffer if any one should distribute poor quality fish. Additional members are being recruited in order to generate additional funding to support marketing efforts directly, to increase the potential of getting government funds to support marketing, and to bring producers together to insure that only high quality products reach the market.

Tilapia markets in the US are segmented between live fish, whole frozen fish, frozen fillets and fresh fillets. Growth in the live market has slowed in recent years. The traditional ethnic market demand (Los Angeles, San Diego, San Francisco, Vancouver, Houston, New Orleans, New York and most importantly Toronto) seems to be met and additional markets must be developed. Grocery stores and restaurants with live tanks, and local "farmer markets" are the

most likely sectors to expand. Supplies of live fish from US producers will continue to supply most, if not all, of the demand.

Graph 16: Frozen tilapia fillets - ex-warehouse price New York in US\$/lb



Source: INFOFISH Trade News

Markets for whole frozen tilapia are still large and demonstrate some continuing growth. This market, mostly supplied by product from Taiwan Province of China and increasingly the mainland of China, has a much lower growth rate than fresh fish fillets.

Whole frozen fish has the most uneven record for quality and improved

quality of the fish should be a priority if market is to expand. Greater consumer awareness of tilapia as a product and increased marketing activity generated by the TMI should further increase demand. Strategies to market imported as well as locally produced tilapia products have been refined in the past year or two. The overwhelming response from the consumers side, has obligated producers and marketers be innovative and exceed customer's expectations, especially in this age when tilapia products are in high demand.

Most of the major East coast and Midwest chains, Publix, Winn Dixie, Stop and Shop, and Kroger, now feature tilapia as a staple of their seafood case, where it is regularly sold at US\$ 5.99/lb and put on special at US\$ 4.99/lb. Product quality is reported as excellent and well received by US Trendy restaurants in California's Napa Valley, have taken a sashimi quality frozen tilapia fillet, to serve it raw and in "ceviches" (raw, marinated fish dish). On the other hand domestic producers across the nation have seen prices for live tilapia in the major market centers decreasing at an alarming rate due to competition of imported tilapia.

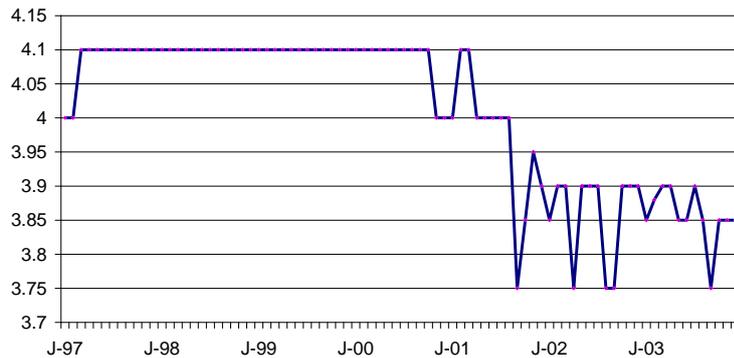
Table 12: Typical price ranges (US\$/kg) for different tilapia products in the USA

Product type	Farm price	Wholesale	Retail
Whole			
- frozen	1.10-2.00	2.00-2.35	2.20-5.00
- fresh	2.30-3.00	3.00-4.00	4.00-9.00
- live	2.20-6.60	2.80-7.50	4.00-10.00
Fillet			
- frozen	4.80-6.75	5.50-7.80	7.00-11.50
- fresh	5.00-7.00	6.00-8.00	8.00-12.00

Source: industry communications and various publications

In foodservice, tilapia is perfect for the mid scale and casual restaurant segments. McCormick & Schmick's, Red Lobster and Bahama Breeze have been early pioneers and a lot of tilapia is sold as generic whitefish at independent family style restaurants. A typical menu price for a 5-6 oz. fillet in a casual restaurant is \$9-15 for dinner and \$7-12 for lunch. While as a sandwich, Tilapia fillets are sold for up to US\$ 9 for one meal. And it has, of course, long been a staple in Oriental restaurants.

Graph 17: Chilled Tilapia fillets
wholesale US market, in US\$/lb, origin Costa Rica



Source: INFOFISH Trade News

Tilapia has been on the menu of many well-known upscale restaurants, including K-Paul's in New Orleans, Tabor Hill Winery & Restaurant in Michigan, La Calle Doce in Dallas, Sandy's Polo Club in Pittsburgh and Tempo in Encino, California. It fits well in with college, health care and B&I operations.

In retail, Kroger, Publix, Winn-Dixie and Stop and Shop are among the many supermarkets selling it in their fresh fish counters and Costco and Sam's Club have marketed the specie. A typical supermarket store on the east coast sells as much as a 1,000 lbs. a week.

2.2.2.2. Europe

The UK is considered the major European outlet for tilapia, which is also marketed in France, Belgium, Germany, the Netherlands, and in smaller quantities in Austria, Italy, Switzerland, Denmark and Sweden. Tilapia consumption follows the normal regional distribution pattern of fish consumption. The Northern part of Europe prefers fillets, while the South generally chooses whole fish, rather than fillets. Therefore, the North is a better market for tilapia products than the South.

The main markets are the big European cities where large communities of African, Chinese and Asian people live, in particular London, Paris and Amsterdam. Recently, consumption of tilapia has also increased in non-ethnic markets. Nearly all the tilapia marketed in Europe comes from imports, since European production is rather scanty. Until five years ago only Belgium farmed tilapia, but now the UK and France have also started production. Germany, Norway and Denmark are also experimenting tilapia farming. According to FAO statistics, European aquaculture production of tilapia reached a peak of 320 MT in 1996, to go down to 200 MT at present. The species produced is not identified.

Table 13: European tilapia production by country – in MT

Country	1990	1992	1994	1996	1998	2000	2001
Belgium	200	200	200	200	200	180	200
Malta	3	<0.5	<0.5	<0.5	-	-	-
United Kingdom	.	.	.	120	.	.	.
TOTAL	203	200	200	320	200	180	200

Source: Fishstat+

Table 14: European tilapia production by species – in MT

Species	1990	1992	1994	1996	1998	2000	2001
Oreochromis (=Tilapia) spp	200	200	200	200	200	180	200
Oreochromis mossambicus	.	.	.	120	.	.	.
Oreochromis niloticus	2	<0.5	<0.5	<0.5	-	-	-
Oreochromis spilurus	1	<0.5	<0.5	<0.5	-	-	-
TOTAL	203	200	200	320	200	180	200

Source: Fishstat+

Unfortunately, it is not possible to obtain an overall and exhaustive picture of the tilapia imported into Europe, as no import figures are available. Tilapia is not identified as an item in neither national nor European Union statistics, but it is included under other freshwater species. According to various sources, the main suppliers are Taiwan Province of China, Indonesia, Thailand, China, Viet Nam, Malaysia, USA, Costa Rica, Jamaica, and recently Zimbabwe (fresh fillets) and Uganda.

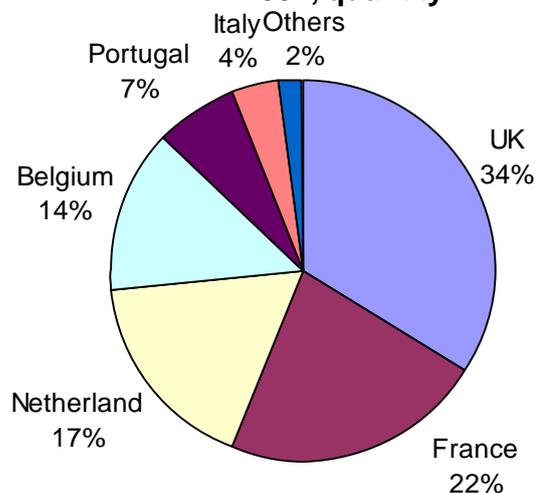
Table 15: EU market for tilapia

Main Markets	UK, France, Belgium, Netherlands, Germany
Main Suppliers	China (Taiwan and Mainland), Indonesia, Thailand, Zimbabwe, Malaysia
Main Product Forms	Mainly whole frozen, but increase of fillets, both fresh and frozen
Preferred Size	Large tilapia is preferred

Source: Industry contacts and literature

Graph 18:

Taiwanese PC Exports of Whole Frozen Tilapia to Europe in 2002, quantity



Source: National Statistics

The author tried to estimate the EU market by using the Taiwanese Province of China export statistics, where tilapia is identified, and by using the category “freshwater not identified” for those countries, where the imported product is likely to be tilapia². The below table is the result of this trial. It becomes apparent that imports of tilapia – or unidentified freshwater fish likely to be tilapia – are growing in EU but less rapidly than anticipated. It also shows that when compared to the US market, tilapia fillets imports play only a marginal role, and that imports of this product is even declining.

Table 15: Frozen Tilapia imports into EU³ – in MT

	1996	1997	1998	1999	2000	2001	2002
China	85.9	45.4	74.1	132.0	572.8	1,863.1	197.6
Taiwan PC	1,476.2	1,856.2	2,833.3	4,042.0	5,087.3	5,543.5	7,382.5
Jamaica	1.5						
Brazil	21.0	10.1	10.5	8.5	0.3		107.2
Ecuador	14.1	37.1	38.6		48.0	55.1	27.7
Others	222.9	128.0	84.3	193.8	180.1	240.7	91.4
TOTAL	1,821.6	2,076.8	3,040.8	4,376.3	5,888.5	7,702.4	7,806.4

Source: Calculations based on EUROSTAT

Taiwanese Province of China exports are mainly frozen tilapia. In 2002, some 6 000 MT were exported to the EU, 7 300 MT to the whole of Europe. The main EU market for Taiwanese Province of China frozen whole tilapia is UK with 34%, followed by France (22%) and the

² Taiwan PC, Zimbabwe, China, Jamaica, Brazil, Venezuela, Malaysia, Ecuador, Colombia, Costa Rica

³ Taiwan PC, Zimbabwe, China, Jamaica, Brazil, Venezuela, Malaysia, Ecuador, Colombia, Costa Rica

Netherlands (17%). The market for frozen fillets is much smaller, only 600 MT were exported in 2002, mainly to Germany. The emergence of Germany as a main fillet importer is relatively recent.

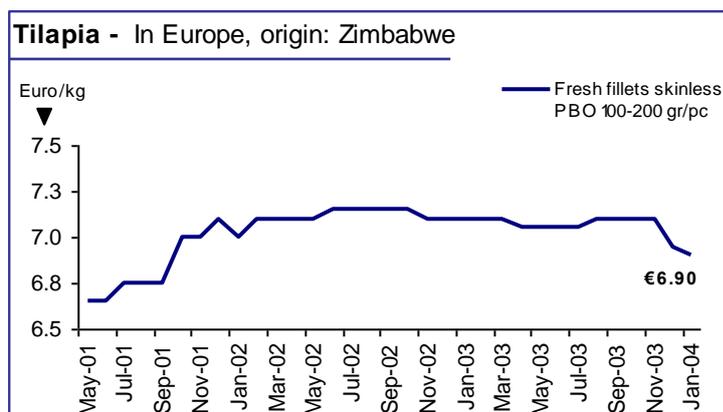
Table 16: Fresh Tilapia fillet imports into EU⁴ – in MT

	1996	1997	1998	1999	2000	2001	2002
Zimbabwe			11.7	54.4	29.7	363.8	284.4
Jamaica	1.5		25.4	37.9	80.7	76.8	90.8
Brazil					0.4		8.5
Ecuador	14.1				0.1	2.0	
Others	11.1	16.9	0.1		17.6		
TOTAL	26.7	16.9	37.2	92.3	128.5	442.6	383.7

Source: Calculations based on EUROSTAT

⁴ Taiwan PC, Zimbabwe, China, Jamaica, Brazil, Venezuela, Malaysia, Ecuador, Colombia, Costa Rica

Graph 19: Tilapia fresh fillet prices in Europe



Apart from Taiwan Province of China very few other countries are exporting tilapia or tilapia products to the EU. Some fresh fillets arrive from Zimbabwe (not more than 284 MT in 2002) and Jamaica (90 MT). The fresh fillets from Zimbabwe mainly go to the UK market, where CDC has developed ready outlets in various supermarkets. Prices of fresh tilapia fillets in the European

market have been quite stable for the whole of 2002 and good part of 2003 at over Euro 7.00/kg, only recently they have gone down to Euro 6.90/kg in January 2004.

Frozen tilapia fillet imports into the EU declined in 2002, as both Ecuador and Zimbabwe decreased exports of this product. Taiwan Province of China captured an important slot in this market segment, accounting for almost 90% of EU imports in 2002.

Table 17: Frozen Tilapia fillet imports into EU⁵ – in MT

	1996	1997	1998	1999	2000	2001	2002
Zimbabwe		13.2		19.6	185.9	225.7	41.9
Taiwan PC		4.2	81.4	191.1	111.0	115.8	545.5
Brazil						11.2	18.1
Ecuador	68.6	35.6	81.7	64.7	77.8	179.2	9.1
Others	0.2	4.6	1.9	32.1	115.3	322.1	34.1
TOTAL	68.8	57.6	165.0	307.5	490.0	854.0	648.7

Source: Calculations based on EUROSTAT

On the whole, the European market seems to prefer larger-sized tilapia compared to the USA. Tilapia is imported in various forms, but it is preferred whole frozen. Nile tilapia seems to be preferred in Germany, where it is mainly utilised as a substitute for redfish (*Sebastes* spp.). In the UK, red tilapia from Jamaica, imported in fresh form, is particularly appreciated. In recent years, tilapia has become a competitor to traditional whitefish species, and several producing countries now export a significant proportion of their production. There is also increasing interest in Europe. Tilapia fillets are now being imported into Europe in three forms: fresh (chilled), supercooled and frozen. Fillet sizes range from 100-200 g. Both fresh and frozen fillets are sold in France, but Germany, the Netherlands, Belgium, Italy and Spain only import fresh fillets. Only Jamaica and Zimbabwe are known to export farmed tilapia products to Europe but wild-caught tilapia are also exported, mostly mainly from the countries adjacent to Lake Victoria (Uganda, Tanzania and Kenya). Zimbabwe's farmed tilapia (mostly fresh and frozen fillets) is mostly brought into Europe through Belgium.

⁵ Taiwan PC, Zimbabwe, China, Jamaica, Brazil, Venezuela, Malaysia, Ecuador, Colombia, Costa Rica

Tilapia from Jamaica has been exported to the UK for more than a decade, but fillets were introduced only recently on to this market. Jamaica is now slowly moving into the continental European market and has established a foothold in Belgium. In fact in 2002, all Jamaican fresh freshwater fillets went to Belgium. There are also some quantities of wild-caught tilapia from Lake Victoria being exported to Europe. Prices have been about 20% below those for farmed tilapia and this product has consequently captured market share. Supplies of wild tilapia are irregular and import quantities have varied a great deal. On average, about 25 MT of wild tilapia have been imported per month.

Tilapia is competing with cod and haddock, which are much more firmly established. But cod supplies in recent years have decreased and prices have increased, so tilapia appears to be in a good position to capture European market share from these species. It may be necessary to promote tilapia generically with consumers and wholesalers, because consumer's awareness for tilapia is low and there is much room for expanding its market share. During the last 15 years consumption of seafood in countries of the European Union (EU) has grown significantly due to various factors. One of these is that, at the time the consumer is purchasing seafood products, he/she is using several selection criteria (in addition to price), including organoleptic characteristics, its nutritional value, ease of preparation, sanitary aspects related to product handling, freshness, how innovative the presentation is and also other aspects related to the environmental characteristics of the region from where the product originated. Another factor has to do with the traditional ways of marketing seafood products in Europe, both from fishery activities and from aquaculture.

These ways are undergoing evident modifications, where the main players are changing their market share through mergers and acquisitions with large companies devoted to the marketing of products other than seafood. This is partly due to the strong advertising efforts to motivate consumers to increase consumption of seafood products, adopted by EU countries through their respective fishing and aquaculture ministries and agencies, associations of seafood producers, processing plants and industrial chambers, and marketing entities (including supermarkets, catering and franchising companies) among others. This has generated a strong dependency on seafood imports from third countries (outside the EU) with the objective of fulfilling this growing demand in countries with the highest rates of seafood consumption, including Spain, France, Italy and Germany, which import over 22% of the global production. This dependency situation tends to increase due to the policies to reduce fishing effort currently implemented by EU countries in its common fishing areas. To have access to the EU seafood markets very strict sanitary norms must be followed to guarantee products of the highest quality.

2.2.2.3. Arab region

Another important market for tilapia is represented by Arab countries. Tilapia consumption comes from domestic production (in 2001 161 000 MT from aquaculture, with Egypt as main producer) and from imports. Tilapia production which had boomed in Egypt during the late nineties seems to have reached a plateau. Marketing of tilapia in Egypt is a problem, with prices declining sharply, making aquaculture un-profitable. A lot needs to be done, to develop on the one hand the international trade of tilapia on the other hand, develop a good distribution system in order to feed the poor in Egypt with a good protein product.

Table 18: Tilapia aquaculture production in Arab countries – in MT

Country	1990	1992	1994	1996	1998	2000	2001
Egypt	24,916	21,505	25,214	27,854	52,755	157,425	152,515
Jordan	40	16	67	135	263	563	540
Kuwait	-	-	-	-	70	30	16
Saudi Arabia	1,926	2,191	2,220	3,614	3,315	3,968	3,981
Sudan	234	200	200	1,000	1,000	1,000	1,000
Syrian Arab Republic	596	1,126	991	1,588	1,372	2,626	3,195
United Arab Emirates	<0.5	<0.5	<0.5	<0.5	-	-	-
TOTAL	27,712	25,038	28,692	34,191	58,775	165,612	161,247

Source: FISHSTAT+

In 2002 Arab countries imported 6 200 MT of frozen tilapia from Taiwan Province of China, only a slight increase from the 5 800 MT imported in 1999, but more than double the 1996 imports. Saudi Arabia alone imported 4 200 MT, slightly less than in 1999. Kuwait imported 1 400 MT in 2002, about double the 1999 amount. United Arab Emirates, Bahrain, and Jordan also import some frozen tilapia from Taiwan Province of China. Arab countries do not import any fillets. It is likely that the Taiwanese exports have been replaced by Chinese Mainland exports in recent years, following the trend experienced in the US and the EU market. Therefore it is safe to say that tilapia consumption by and imports into Arab countries are growing, and the region is an increasing market for frozen tilapia.

Table 19: Tilapia exports from Taiwan Province of China to Arab countries – in MT

	1996	1997	1998	1999	2000	2001	2002
Bahrain	*	*	*	*	64	113	69
Egypt	*	*	*	*	96	0	0
Jordan	*	*	*	*	24	71	6
Kuwait	580	595	1,252	839	790	1,446	1,525
Qatar	0	0	0	0	0	9	0
Saudi Arabia	2,062	4,050	4,791	4,486	3,346	4,038	4,280
U Arab E	*	*	*	*	395	630	423
Others	212	404	892	512	0	0	0
Total	2,854	5,048	6,935	5,836	4,714	6,306	6,303

*) included under other.

Source: National statistics

2.2.2.4. Canada

In Canada, tilapia consumption has increased substantially in the last few years. The live market is particularly important in Toronto that is considered the single biggest market for live tilapia in North America. This market is supplied by the USA and by domestic production. According to the Taiwanese Province of China statistics, Canadian imports of tilapia from this country have grown by 365% since 1996, going from 502 MT to 1 800 MT in 1999. Since then, Canadian imports from Taiwan Province of China have not grown spectacularly, to reach almost 2 000 MT in 2002. Again, it is most likely, that China Mainland has replaced the Taiwanese exports. In addition, Canada imports about 100 MT of frozen tilapia fillets per year. Furthermore, Canada imports fresh and frozen tilapia from Costa Rica and Jamaica.

2.2.2.5. Latin America

Tilapia consumption is growing in many Latin American countries particularly in Colombia, Venezuela, Jamaica, Puerto Rico, Brazil, Mexico and Cuba. Once, tilapia was a fish for home consumption of subsistence farmers. In the 1950s FAO introduced tilapia in many American countries in order to supply animal protein for subsistence farmers and as a source of income. In Colombia tilapias are particularly appreciated and consumption is supplied by domestic production and imports from Venezuela and Ecuador. In June 2003 the Brazilian Ex-pond price for whole tilapia was US\$ 1.00/kg, while retail prices were US\$3.00/kg whole frozen, and US\$ 5.00/kg fillets frozen.

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Appendix 1: US importers of tilapia

A.F. Import & Wholesale Co.

2201 Jefferson Ave

Houston, TX 77003

UNITED STATES

Phone: 713-228-7898

Fax: 713-228-7998

E-mail: info@afwholesale.com

Web site: www.afwholesale.com

Baja Pacific Ltd.

PO Box 6692

Mesa, AZ 85216-6692

UNITED STATES

Phone: 480-641-3497

Fax: 480-985-2732

Black Tiger Co., Inc.

1301 Bremen Ave

Egg Harbor City, NJ 08215

UNITED STATES

Phone: 609-804-1158

Fax: 609-804-1179

Casile, Inc.

1594 York Ave; PO Box 15

New York, NY 10028

UNITED STATES

Phone: 917-822-0590

Fax: 212-737-1492

E-mail: casile@att.net

Crystal Cove Seafood Corp

109 S Tyson Ave

Floral Park, NY 11001

UNITED STATES

Phone: 516-354-1135

Fax: 516-354-0584

E-mail: cove50@aol.com

Classic Bay Seafood, Inc.

PO Box 608

Jericho, NY 11753

UNITED STATES

Phone: 516-822-0186

Fax: 516-822-0758

E-mail: gk4fish@aol.com

Contessa Food Products

222 W Sixth St, Suite 800

San Pedro, CA 90731

UNITED STATES

Phone: 310-832-8000

Web site: www.contessa.com

Dakon Foods

740A - 105th Ave

Oakland, CA 94603

UNITED STATES

Phone: 510-633-1409

Fax: 510-633-0750

E-mail: michael@dakoninc.com

Web site: www.dakoninc.com

Delca Distributors Inc.

Mercado Central Edificio D Zona

Portuaria

Pueblo Viejo

San Juan , 00920

PUERTO RICO

Phone: 787-792-9600

Fax: 787-782-6195

E-mail: delca@coqui.net

Web site: www.bmtny.com

E. Frank Hopkins Co. Inc.

3427 S Lawrence St

Philadelphia , PA 19148

UNITED STATES

Phone: 215-468-9190

Fax: 215-468-9189

E-mail: EHOPKINS@NNI.COM

Web site: www.efrankhopkins.com**Enaca International**

3900 NW 79th Avenue

Suite 570

Miami, FL 33166

UNITED STATES

Phone: 305 599-8877

Fax: 305 599-2255

E-mail: sales@enacausa.com

Endeavor Seafood, Inc.

172 Thames St, Suite 200

Newport, RI 02840

UNITED STATES

Phone: 401-841-8637

Fax: 401-841-8639

E-mail: info@endeavorseafood.com

Web site: www.endeavorseafood.com**Export, Inc.**

P.O. Box 817

Barnegat Light, NJ 08006

UNITED STATES

Phone: 609-361-0402

Fax: 609-361-9031

E-mail: info@exportfish.com

Web site: www.exportfish.com**Flying Fish Import / Export Inc.**

2480 Hamilton Parc Lane

Buford, GA 30519

UNITED STATES

Phone: 770-614-8077

Fax: 770-614-8077

E-mail: stephenp@quixnet.net

Glenn Sales

6640 Powers Ferry Rd NW, #150

Atlanta, GA 30339-2969

UNITED STATES

Phone: 770-952-9292

Fax: 770-988-9325

E-mail: bruce@glennsales.com

Great Fish Co, The

800 Vinial St , Suite B-308

Pittsburgh, PA 15212

UNITED STATES

Phone: 412-321-8501

Fax: 412-321-8506

Grobest USA

255 E Santa Clara Ave, Suite 310

Arcadia, CA 91006

UNITED STATES

Phone: 626-445-9990

Fax: 626-445-9991

E-mail: mailbox@grobestusa.com

Web site: www.grobestusa

Hilo Fish Company

55 Holomua St

Hilo, HI 96720-5101
UNITED STATES
Phone: 808-961-0877
Fax: 808-934-8783
E-mail: hilofish@interpac.net

International Business Trading Corp.

4833 Fruitland Ave

Vernon, CA 90058
UNITED STATES
Phone: 323-277-0000
Fax: 323-869-8889
E-mail: ibtcorp@ibt-corp.com
Web site: www.ibt-corp.com

John Keeler / Blue Star Food Products

3000 NW 109th Ave

Miami, FL 33172
UNITED STATES
Phone: 888-663-2722
Fax: 305-503-0880
E-mail: sales@onecrab.com
Web site: www.onecrab.com

Katamaran Corp.

PO Box 161920

Miami, FL 33116-1920
UNITED STATES
Phone: 305-634-6696
Fax: 305-635-3161
E-mail: gsherrera@aol.com

Lindex ,Inc.

15344 E Valley Blvd, Unit B

City Industry, CA 91746
UNITED STATES
Phone: 626-855-3476
Fax: 626-855-3480
E-mail: lindex@juno.com

Lobo Mar Products

PO Box 3777

Cerritos, CA 90703-3777
UNITED STATES
Phone: 562-229-9622
Fax: 562-407-0662
E-mail: CEJASHRIMP@AOL.COM

Louisiana Premium Seafoods, Inc.

125 W Railroad Ave
PO Box 68
Palmetto, LA 71358-0068
UNITED STATES
Phone: 337-623-4232
Fax: 337-623-5852

Lu Mar Lobster & Shrimp, Inc.

880 Ridgewood St, Suite 4

Brownsville, TX 78520-8646
UNITED STATES
Phone: 956-546-5525
Fax: 956-546-0871
E-mail: JHARDING@LU-MAR.COM

Mazzetta Company

1990 St Johns Avenue
Highland Park, IL 60035-3183
UNITED STATES
Phone: 847-433-1150
Fax: 847-433-8973

Metro Seafoods Intl
12220 McCullagh Ct

Upper Marlboro, MD 20772-5300
UNITED STATES
Phone: 301-856-6077
Fax: 301-856-1165
E-mail: MORANKATH@AOL.COM
Web site:

Mountain Stream, Inc
6800 NW 36 Avenue

Miami , FL 33147
UNITED STATES
Phone: 866-691-7997
Fax: 305-696-6561
E-mail: larryp@fishofthefuture.com
Web site:

National Seafood Assoc.
Po Box 310163

Miami, FL 33231-0163
UNITED STATES
Phone: 305-358-3533
Fax: 305-358-6848
E-mail:
Web site:

Newport International
1110 Pinellas Bayway # 201

Tierra Verde, FL 33715
UNITED STATES
Phone: 727-866-1188
Fax: 727-864-9445
E-mail: seafood@newportintl.com
Web site: www.newportintl.com

Nov I Ind
1530 Jamacha Rd, Suite D

El Cajon, CA 92019-3757
UNITED STATES
Phone: 619-596-4501
Fax: 619-596-6892

E-mail: novi-ind@pacbell.net
Web site:

Ocean Blue Products
668 S. Alameda Street

Los Angeles, CA 90021-1234
UNITED STATES
Phone: 213-688-0133
Fax: 213-688-0137
E-mail: obpla@aol.com
Web site:

Ocean Duke Corporation
3450 Fujita Street

Torrance, CA 90505
UNITED STATES
Phone: 310-326-3198
Fax: 310-539-0409
E-mail: roger@oceanduke.com
Web site: www.oceanduke.com

Ocean King Defonso Seafood
10400 Griffin Rd, Suite 202

Ft Lauderdale, FL 33328-3321
UNITED STATES
Phone: 954-680-1555
Fax: 954-680-6868
E-mail: OCEAN44054@AOL.COM
Web site:

Pacific American Fish Co., Inc.
(PAFCO)
620 S. Gladys Ave

Los Angeles, CA 90021
UNITED STATES
Phone: 213-623-3433
Fax: 213-614-0427
E-mail: pehuh@pafco.net
Web site: www.pafco.net

Pacific Giant, Inc.

732 S Alameda St

Los Angeles, CA 90021-1616
 UNITED STATES
 Phone: 213-689-4000
 Fax: 213-689-4020
 E-mail: tim@pacificgiant.com

Pierce Seafood

629 Fifth Ave

Pelham, NY 10803-1251
 UNITED STATES
 Phone: 914-738-9541
 Fax: 914-738-9546

Pocasset Seafoods, Inc.

162 Putnam Ave

Johnston, RI 02919
 UNITED STATES
 Phone: 401-232-2500
 Fax: 401-231-8480

Rain Forest Aquaculture

2501 SW 31st St

Fort Lauderdale, FL 33312
 UNITED STATES
 Phone: 954-792-8010
 Fax: 954-792-7458
 E-mail: sales@tilapia.com
 Web site: www.tilapia.com

Regal Springs Tilapia

P.O. Box 20608

Bradenton, FL 34204-0608
 UNITED STATES
 Phone: 941-747-9161
 Fax: 941-747-9476
 E-mail: tilapfilet@aol.com
 Web site: www.regalsprings.com

Rupari Food Services

1208 West Newport Center Dr, Suite 100

Deerfield Beach, FL 33442
 UNITED STATES
 Phone: 954-480-6320
 Fax: 954-480-6367
 E-mail: wvstilwell@yahoo.com

Rzepka & Assoc.

PO Box 16946

Rocky River, OH 44116-0946
 UNITED STATES
 Phone: 440-331-3222
 Fax: 440-331-2869

Sea Harvest Sf

1805 Grand Blvd

Kansas City, OH 64108-1869
 UNITED STATES
 Phone: 816-283-3368
 Fax: 816-283-3226
 E-mail: sharvest@aol.com

Sea Port Products Corporation

15 10TH Ave

San Mateo, CA 94401
 UNITED STATES
 Phone: 650-340-9900
 Fax: 650-347-6603
 E-mail: sales@Cport.net
 Web site: www.Cport.net

Seasource, Inc.

185 Washington St

Morristown, NJ 07960
 UNITED STATES
 Phone: 973-401-1166
 Fax: 973-401-1199
 E-mail: Seasource@mindspring.com

Sigma Int'l, Inc.

333 16th Ave S

St Petersburg, FL 33701-5529

UNITED STATES

Phone: 727-822-1288

Fax: 727-822-6782

E-mail: ANITA@SIGMACORP.COM

SK Trading Corp.

PO Box 770636

Miami, FL 33177

UNITED STATES

Phone: 786-586-3724

Fax: 305-234-7361

E-mail: sktrade12@msn.com

Slade Gorton & Co., Inc.

225 Southampton St

Boston, MA 02118

UNITED STATES

Phone: 617-442-5800

Fax: 617-442-5800

E-mail: mikeg@sladegorton.com

Web site: www.sladegorton.com**Solymer Fisheries Int'l, Inc.**

9600 NW 25th St, Suite 2F

Miami, FL 33172-1416

UNITED STATES

Phone: 305-593-0100

Fax: 305-470-9922

Stavis Seafoods, Inc.

7 Channel St

Boston, MA 02210-2385

UNITED STATES

Phone: 617-482-6349

Fax: 617-482-1340

E-mail: fish@stavis.comWeb site: www.stavis.com**Stolt Sea Farm, Inc.**

350 Long Beach Blvd

Stratford, CT 06615-7167

UNITED STATES

Phone: 203-345-0200

Fax:

E-mail: dana.staples@stoltseafarm.com**Trans-Global Products Inc.**

5444 Bay Center Drive

Suite 211

Tampa, FL 33609

UNITED STATES

Phone: 813-288-8553

Fax: 813-288-8157

E-mail: mark@tg4sfd.com**Tri State Seafood Co**

PO Box 7047

Hampton, VA 23666-0047

UNITED STATES

Phone: 757-928-0725

Fax: 757-838-8025

Tropical Aquaculture Products, Inc

P.O. Box 6311

Rutland, VT 05702-6311

UNITED STATES

Phone: 802-747-6311

Fax: 802-747-6353

E-mail: info@tropicaltilapia.comWeb site: www.eattilapia.com**United Seafood Imports, Inc.**

1499 Beach Dr SE

Saint Petersburg, FL 33701-5623

UNITED STATES

Phone: 727-894-2661

Fax: 727-894-5097

E-mail: united01@aol.com

Appendix 2: European importers of tilapia

Country	Company	Street	Town	ZIP	Code	Tel	Fax	Company Email
BELGIUM	GABRIEL S.A.	Av. de Norvège 1	Malmedy	4960	32	80799479	80338644	malmedy@gabriel.de
BELGIUM	HOTTLET FROZEN FOODS N.V.	Heiveldekens 4	Kontich, Antwerp	2550	32	34513131	34513130	info@hottlet.be
BELGIUM	THALASSA SEAFOODS N.V.	Oude Leeuwenrui 12	Antwerpen	2000	32	32261690	32261170	mail@thalassa-seafoods.com
DENMARK	ROYAL SUPREME SEAFOOD SALES A/S	Dronningegården 23	Odense C	5000	45	63123488	63123418	info@royalsupreme.com
FRANCE	EUROTRADE	56, blvd. de la République	St. Cloud	92210	33	149110505	149110876	fish@eurotrade.fr
NETHERLANDS	AFFISH	Burg. van der Lelystraat 2	Woudrichem	4285	31	183303484	183303375	affish@wxs.nl
NETHERLANDS	ANOVA FOOD B.V.	Hambakenwetering 15	Hertogenbosch	5231	31	737502000	737502001	anova@anovafood.nl
NETHERLANDS	DIL GEBR. IMPORT-EXPORT B.V.	Kerklaan 40	AA Akersloot	1920	31	251312306	251315420	info@dilvis.com
NETHERLANDS	HANSEN - VAN DER VEEN B.V.	Voorland 11	Enkhuizen	1600 AD	31	228314770	228314749	ewliewes@doge.nl
NETHERLANDS	JAC. DEN DULK & ZN. B.V.	Vissershavenweg 27	Scheveningen	2583 DJ	31	703549090	703512785	dendulk@dulk.nl
LUXEMBOURG	LAKE HARVEST INTERNATIONAL	Um Knupp, 30, ap. 1.5	Weidingen (Wiltz)	9535	352	26950775	26950776	sales@lakeharvest.com
NETHERLANDS	SEAFOOD CONNECTION B.V.		ABEM Urk	8320	31	527687066	527687067	seacon@noord.bart.nl
SPAIN	STOLT SEA FARM S.A.	Punta de los Remedios - Lira	Carnota, La Coruña	15292	34	981837501	981761031	enc@stoltseafarm.com