The success story of the Tilapia industry; current and future trends of the US seafood market

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American Tilapia Association, Sec. Tres.

Nong Lam University - Ho Chi Minh, Vietnam

28 June 2012

Tilapia: continuing to increase in popularity globaly

- Tilapias are second only to the carps as a farmed food fish.
- But tilapia have unique characteristics that will facilitate its continued growth to someday surpass carp production.

Subsistence and Export Commodity

- Tilapia is unique in its role as a small livestock animal grown by subsistence farmers in developing countries around the world…..
- And
- It is widely grown and exported to high value markets to be served in expensive restaurants and grocery stores
- Commodity or specialty crop - BOTH, like chicken

Tilapia

- Model for how aquaculture industry should develop
- Global demand, variety of production systems and geographic regions, some vertically integrated
- Environmentally sustainable – “Green Aquaculture” (no fish meal required in the diet, no antibiotics, many farms use effluents for crops)

Tilapia:
The Most Important Aquaculture Species of the 21st Century

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ABSTRACT

In the 1900's, tilapia species were introduced into most of the countries in the world from their original ranges in Africa and the Middle East. They are now grown in commercial farming operations in almost 100 countries. Tilapia are likely to be the most important of all aquacultured fish in the 21st century. The unique mix of tilapias' physiology, reproductive biology, genetic plasticity, development of domesticated strains, and ready marketability have put it at the forefront of aquaculture. The few detracting characteristics are rapidly being overcome by evolving culture systems, selective breeding, gender manipulation and genetic modification. A convergence of improved culture techniques, new farms, low cost diets, ecological efficiency and emerging markets will boost tilapia to be the worlds largest aquaculture crop.

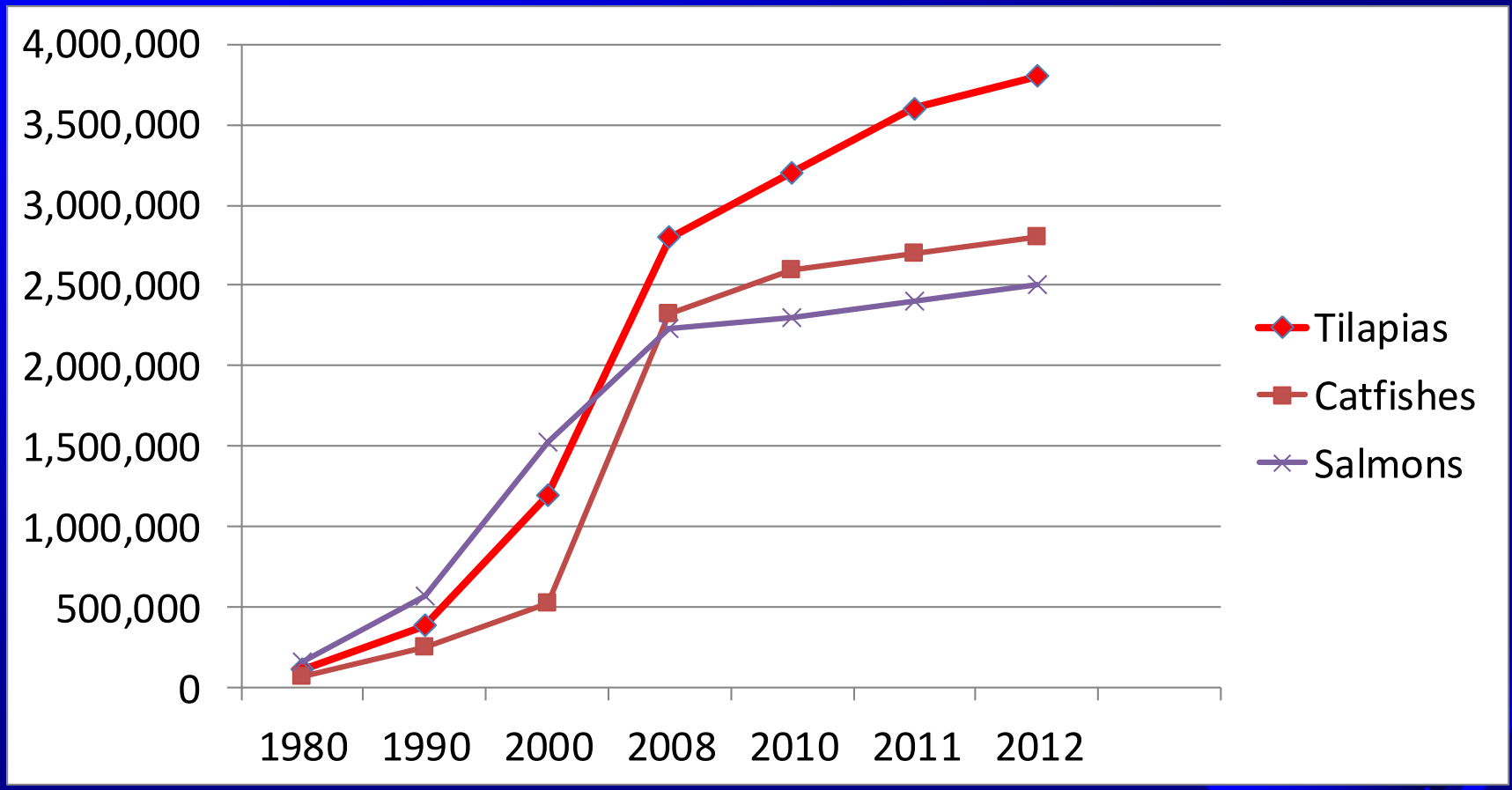
INTRODUCTION

Tilapia were touted as the "Aquatic chicken" by ICLARM and others more than 20 years ago. The phrase may be even more appropriate today than it was then. Like terrestrial chicken, tilapia are now grown around the world. FAO (1997) estimated that world aquaculture production of tilapia had reached 659,000 t in 1995. Tilapia ...

Tilapia: the most important aquaculture species of the 21st century

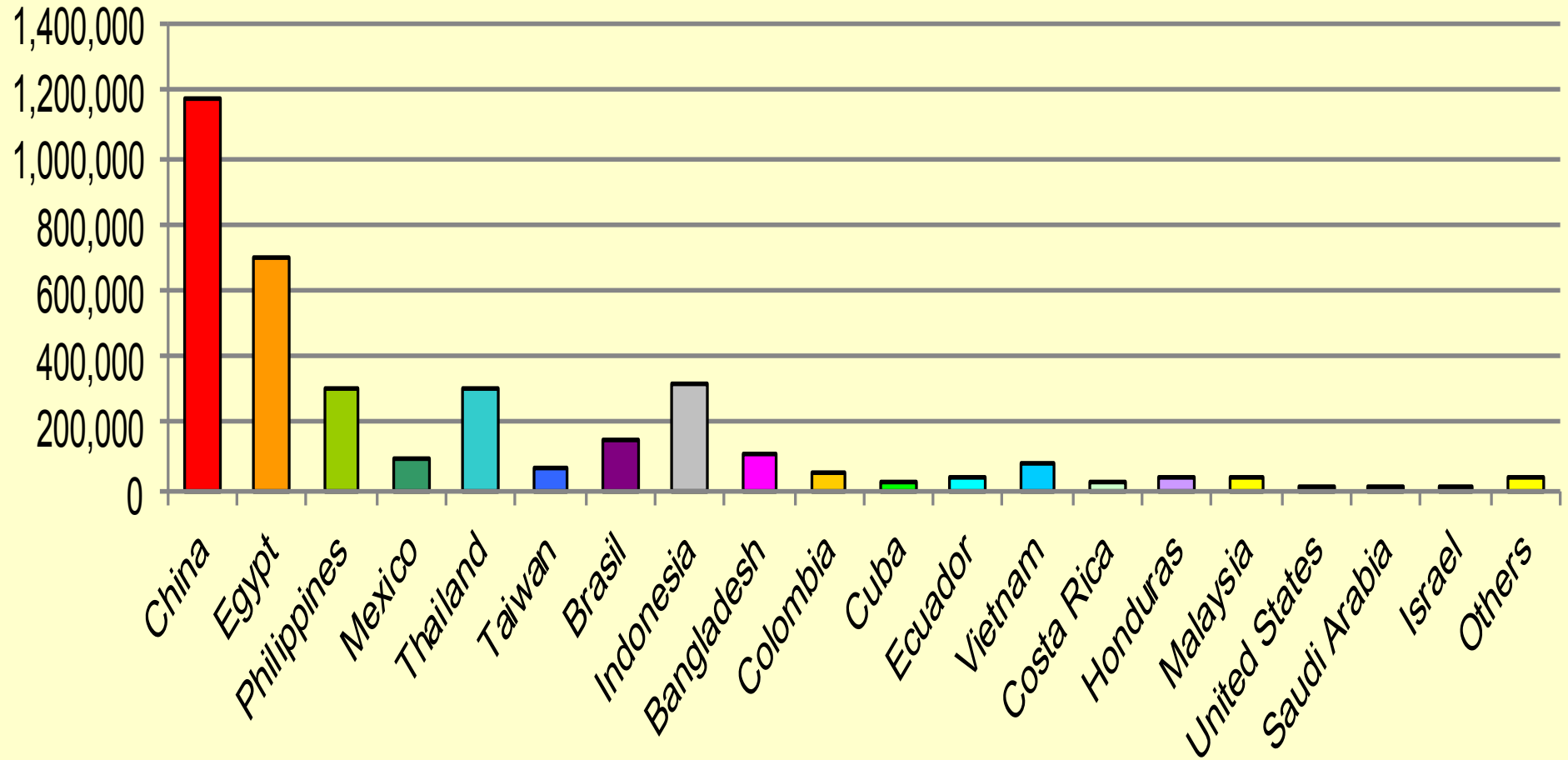
Feb 2000
ISTA 5

Global production of some major farmed fishes

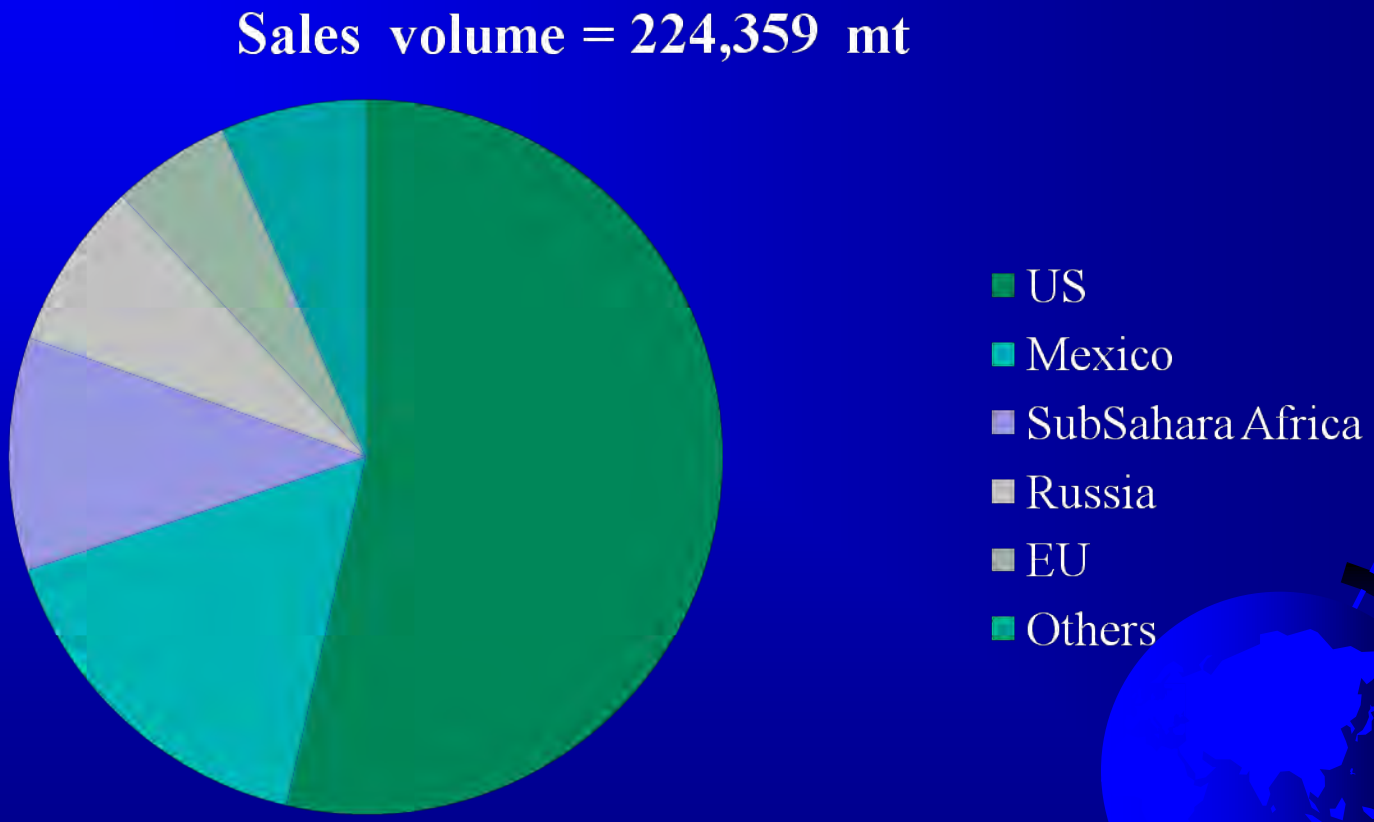


World Tilapia Production of 3,600,000 mt in 2011

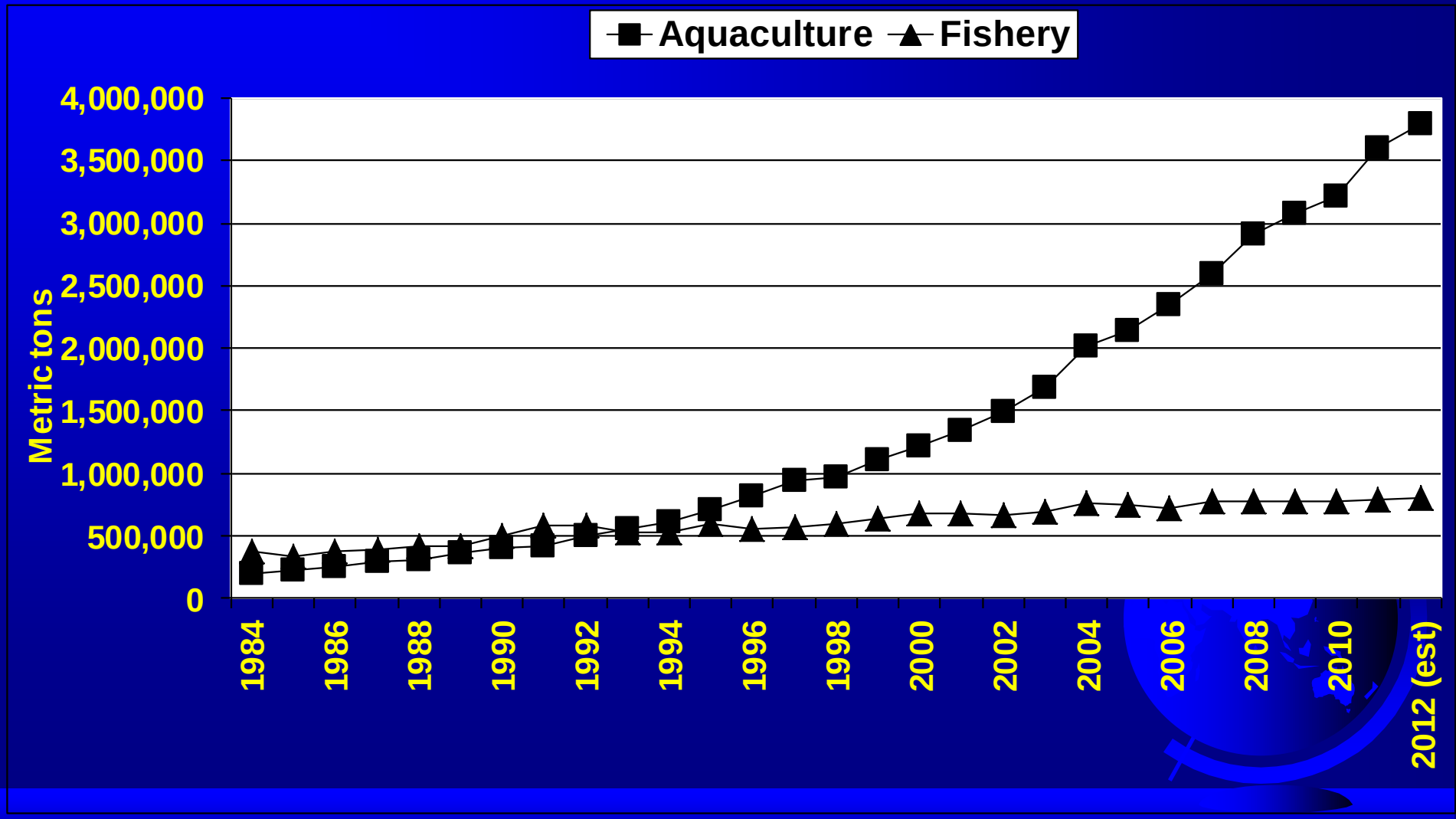
(large revision up of Egyptian production)



2008 Tilapia exports from China



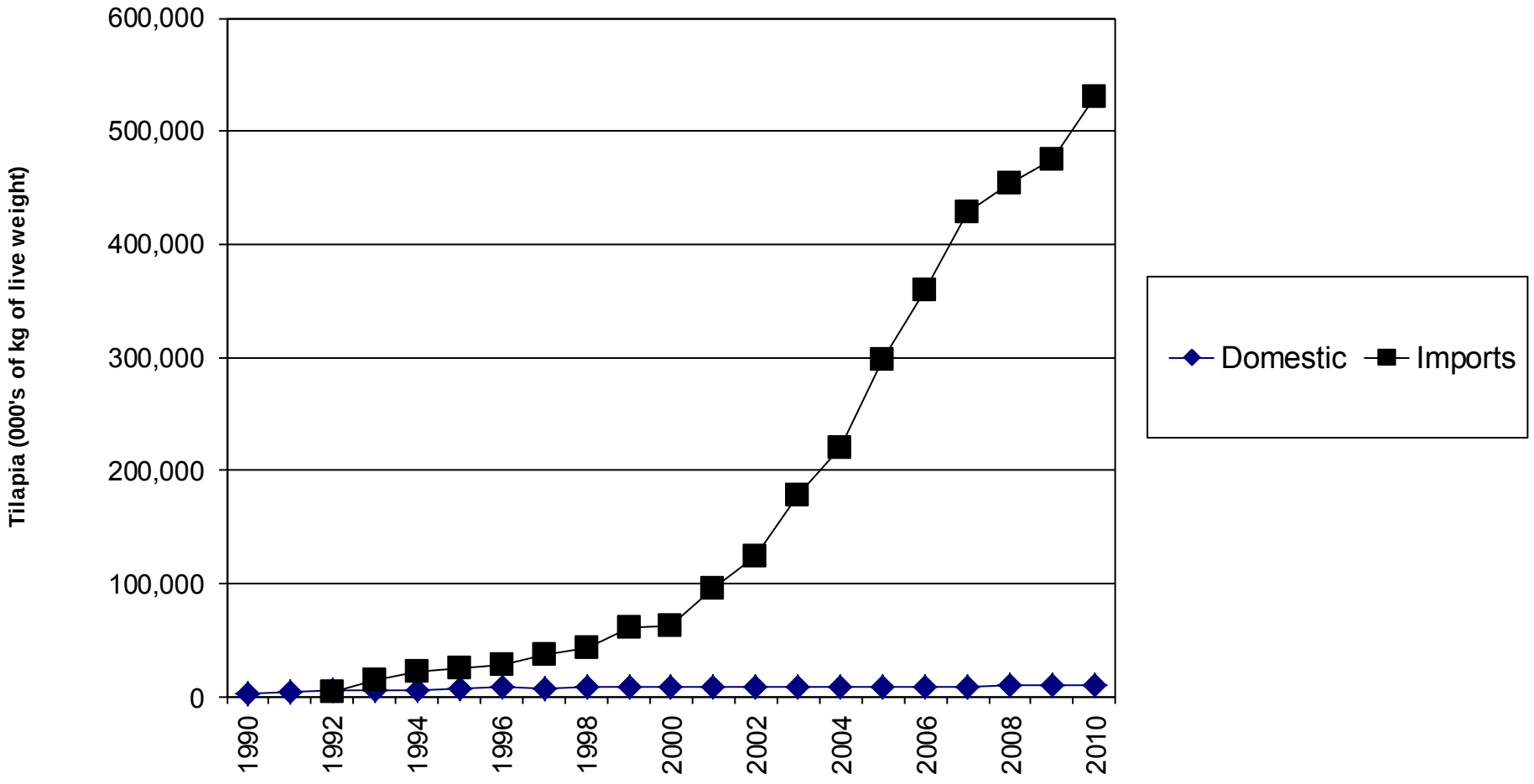
Global production of tilapia



Top Ten Seafoods (U.S.) per capita (lbs)

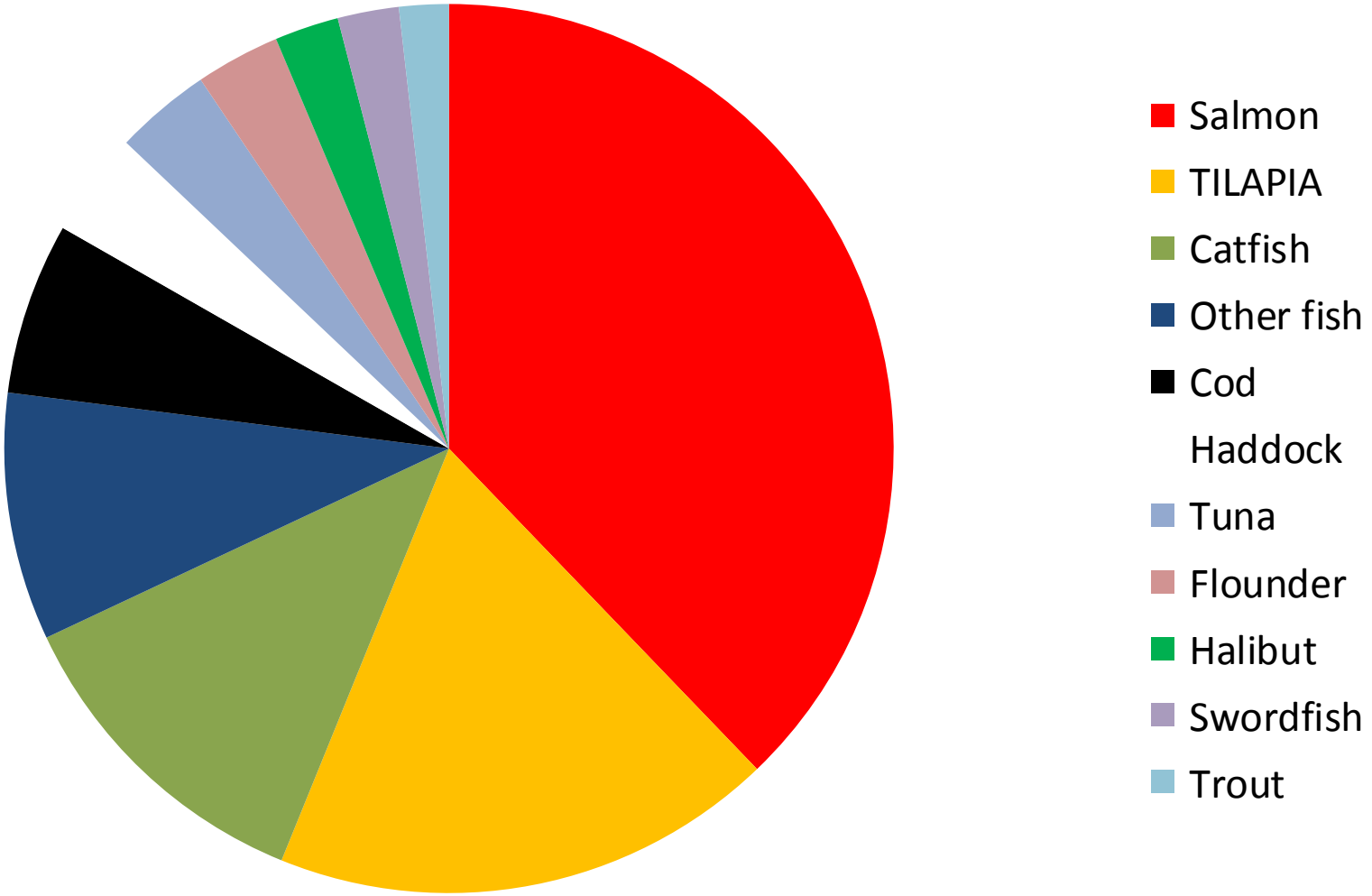
2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Tuna 3.5	Shrimp 3.4	Shrimp 3.7	Shrimp 4.0	Shrimp 4.2	Shrimp 4.1	Shrimp 4.4	Shrimp 4.1	Shrimp 4.1	Shrimp 4.1	**Shrimp 4.0**
Shrimp 3.2	Tuna 2.9	Tuna 3.1	Tuna 3.4	Tuna 3.4	Tuna 3.1	Tuna 2.9	Tuna 2.7	Tuna 2.8	Tuna 2.5	**Tuna 2.7**
Pollock 1.6	Salmon 2.0	Salmon 2.0	Salmon 2.2	Salmon 2.2	Salmon 2.4	Salmon 2.0	Salmon 2.4	Salmon 1.8	Salmon 2.0	**Salmon 2.0**
Salmon 1.5	Pollock 1.2	Pollock 1.1	Pollock 1.7	Pollock 1.7	Pollock 1.5	Pollock 1.6	Pollock 1.7	Pollock 1.34	Pollock 1.45	**Tilapia 1.45**
Catfish 1.1	Catfish 1.1	Catfish 1.1	Catfish 1.1	Catfish 1.1	Catfish 1.0	Tilapia 1.0	Tilapia 1.14	Tilapia 1.19	Tilapia 1.21	**Pollock 1.2**
Cod 0.8	Cod 0.6	Cod 0.7	Cod 0.6	Tilapia 0.7	Tilapia 0.8	Catfish 0.97	Catfish 0.90	Catfish 0.92	Catfish 0.85	**Catfish 0.8**
Clams 0.5	Clams 0.5	Crabs 0.6	Crabs 0.6	Cod 0.6	Crabs 0.6	Crabs 0.7	Crabs 0.68	Crabs 0.61	Crabs 0.59	**Crabs 0.6**
Crabs 0.4	Crabs 0.4	Clams 0.5	Tilapia 0.5	Crabs 0.6	Cod 0.6	Cod 0.5	Cod 0.47	Cod 0.44	Cod 0.42	**Cod 0.5**
Flatfish 0.4	Flatfish 0.4	Tilapia 0.4	Clams 0.5	Clams 0.5	Clams 0.4	Clams 0.4	Clams 0.45	Flatfish 0.43	Clams 0.41	**Pangasius 0.4**
Scallops 0.3	Tilapia 0.4	Flatfish 0.3	Scallops 0.3	Scallops 0.3	Scallops 0.3	Scallops 0.3	Flatfish 0.32	Clams 0.42	Pangasius 0.35	**Clams 0.35**
Tilapia 0.3										

US Consumption of tilapia from domestic and imported sources



Percentage of US finfish grocery sales Feb. 2010

% of sales



US Tilapia consumption (imports and domestic)

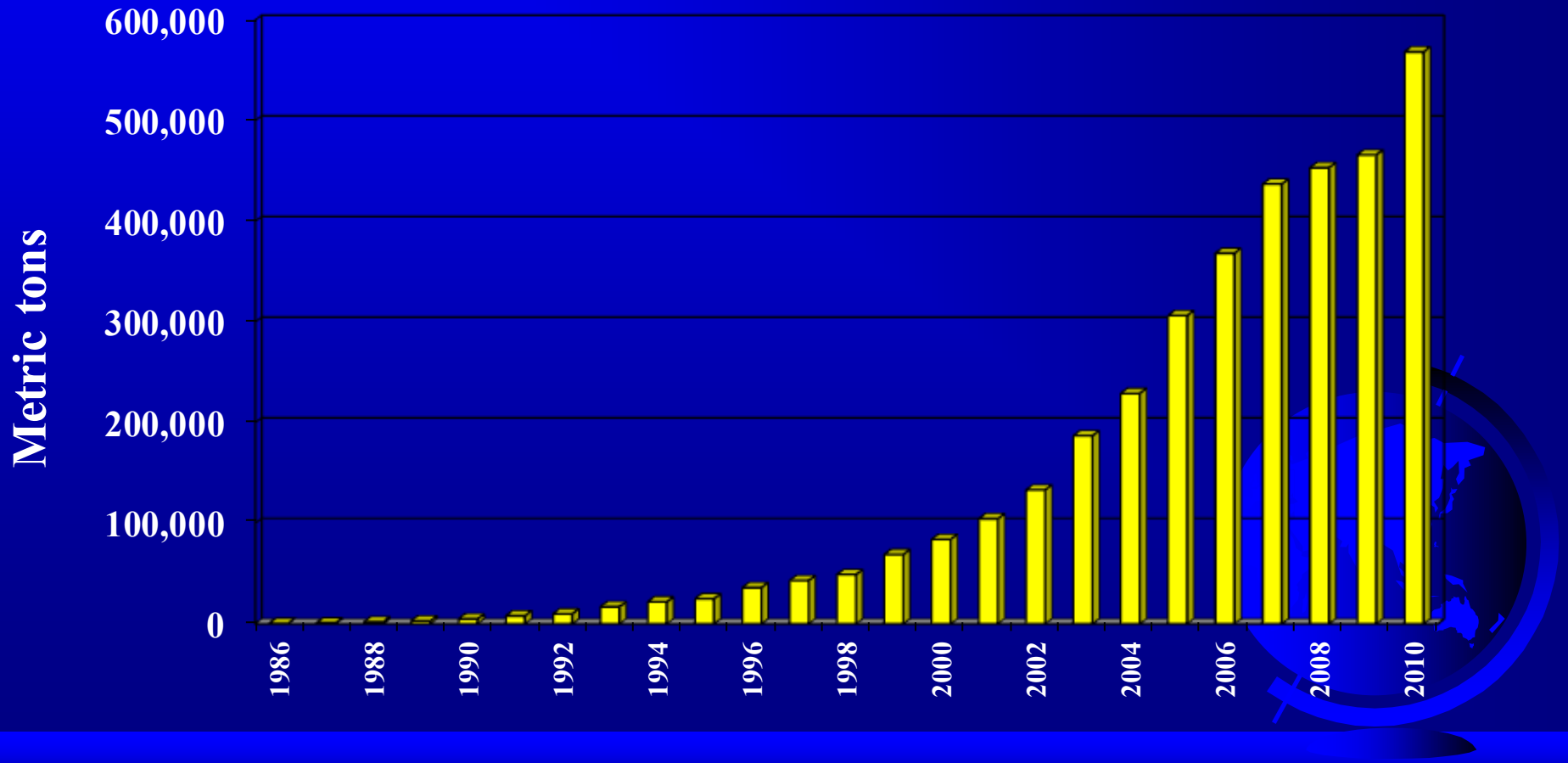
368,295 mt of live weight (equivalent) – 2006

437,000 mt of live weight (equivalent) - 2007

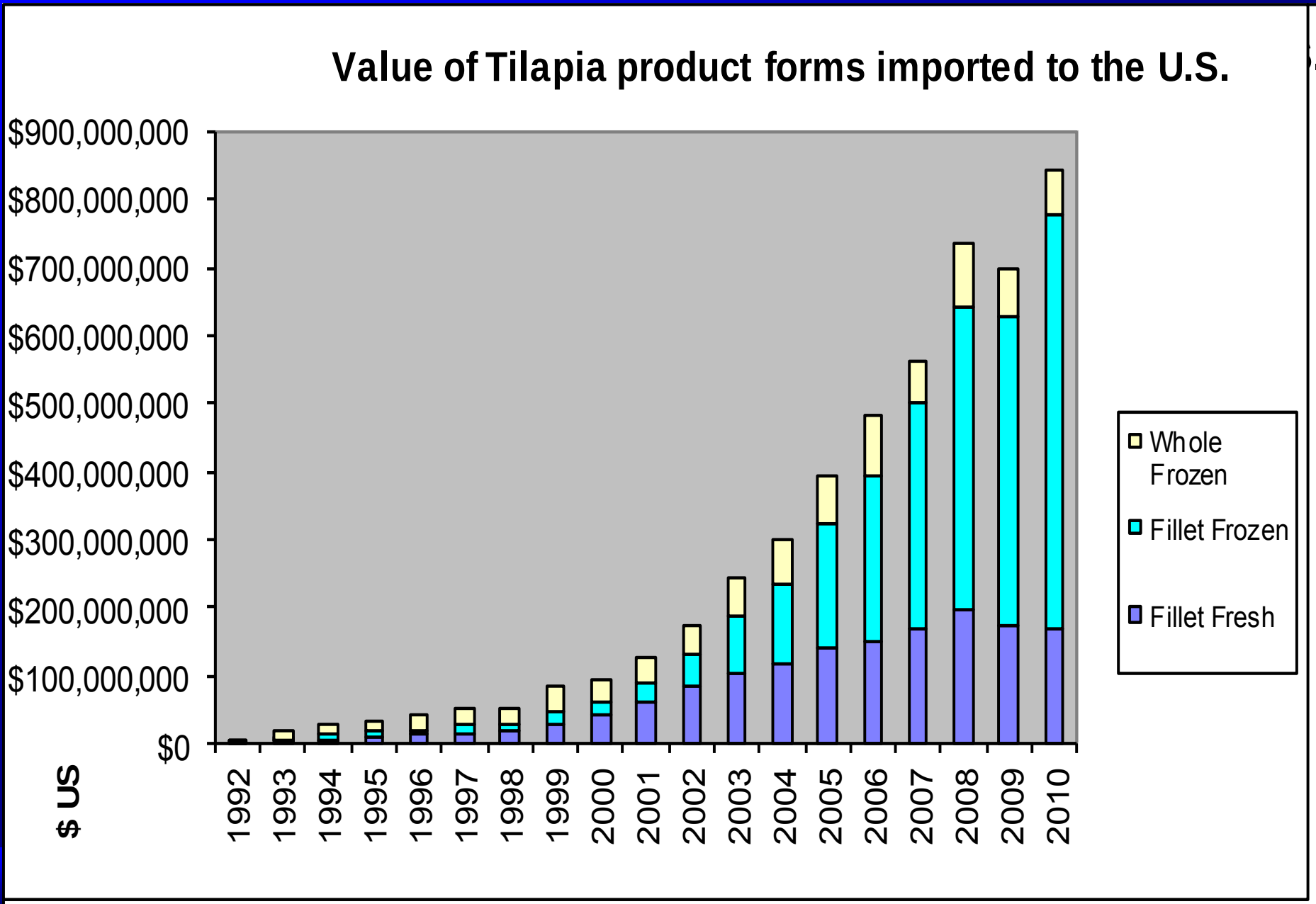
453,264 mt of live weight (equivalent) – 2008

465,953 mt of live weight (equivalent – 2009)

579,443 mt of live weight (equivalent – 2010)



$482,742,515 (2006), $559,788,809 (2007), $734,450,306 (2008) $696,085,981(2009)**$842,866,006(2010)**



US Sales of tilapia

- Imports in 2010 were **$842,866,006**
- US production of 25,000,000 lbs at farm
- 2010 US tilapia farm-gate sales were over **$75,000,000**
- 2010 US Tilapia Sales estimate –
- $**842,866,006** + $75,000,000 = **$917,866,006**

Tilapia breeds

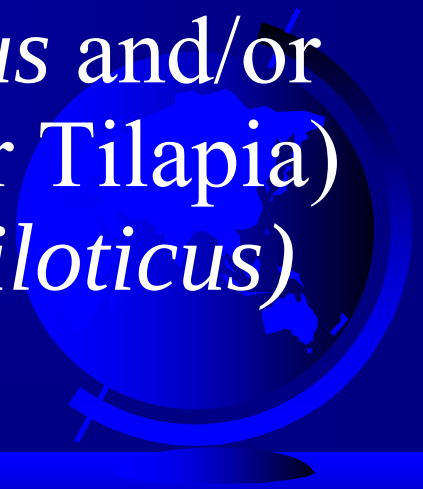
- Proper selection of fish for your type of production system is second most important decision (after marketing)
- There are several species, hybrid strains, and breeding programs available
- Goals are fast growth, good FCR and mostly male fish
- Must determine if farm will buy fry or fingerlings or attempt to maintain own hatchery

Mossambique Tilapia and Red Tilapia

Taiwan Red Strain

Tilapia species and breeds

- *O. niloticus* (Nile Tilapia) – Most commonly used tilapia 70-75% of global production
- *O. aureus* (Blue Tilapia) about 5% of global production
- *O. mossambicus* - (Mossambique or Java Tilapia) about 5% of global production
- Red hybrid strains - *O. mossambicus* and/or *O. urolepis-hornorum* (Wami River Tilapia) crossed with *O. aureus* and/or *O. niloticus)* about 20% of global production



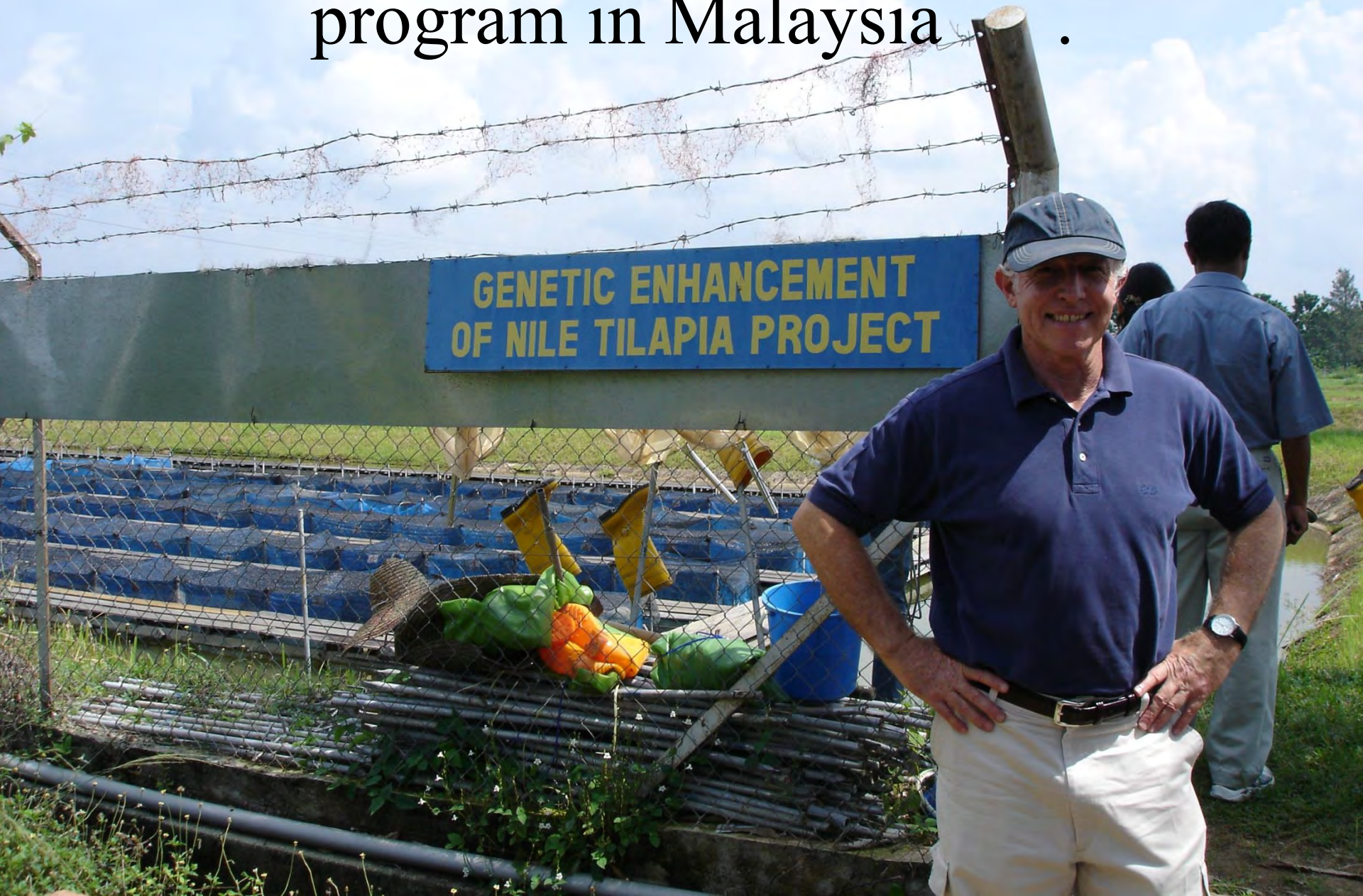
Tilapia species and breeds

- Match fish to production system
- Brackish water – Red hybrid strains
- Pond systems – *O. niloticus* or red strains
- Cage systems and intensive (tanks, raceways or recirculating systems) - *O. niloticus* or red strains
- Cooler temperatures – *O. aureus* or hybrids
- South Africa and California (only *O. mossambicus* and hybrids)

Selective breeding and genetic improvements

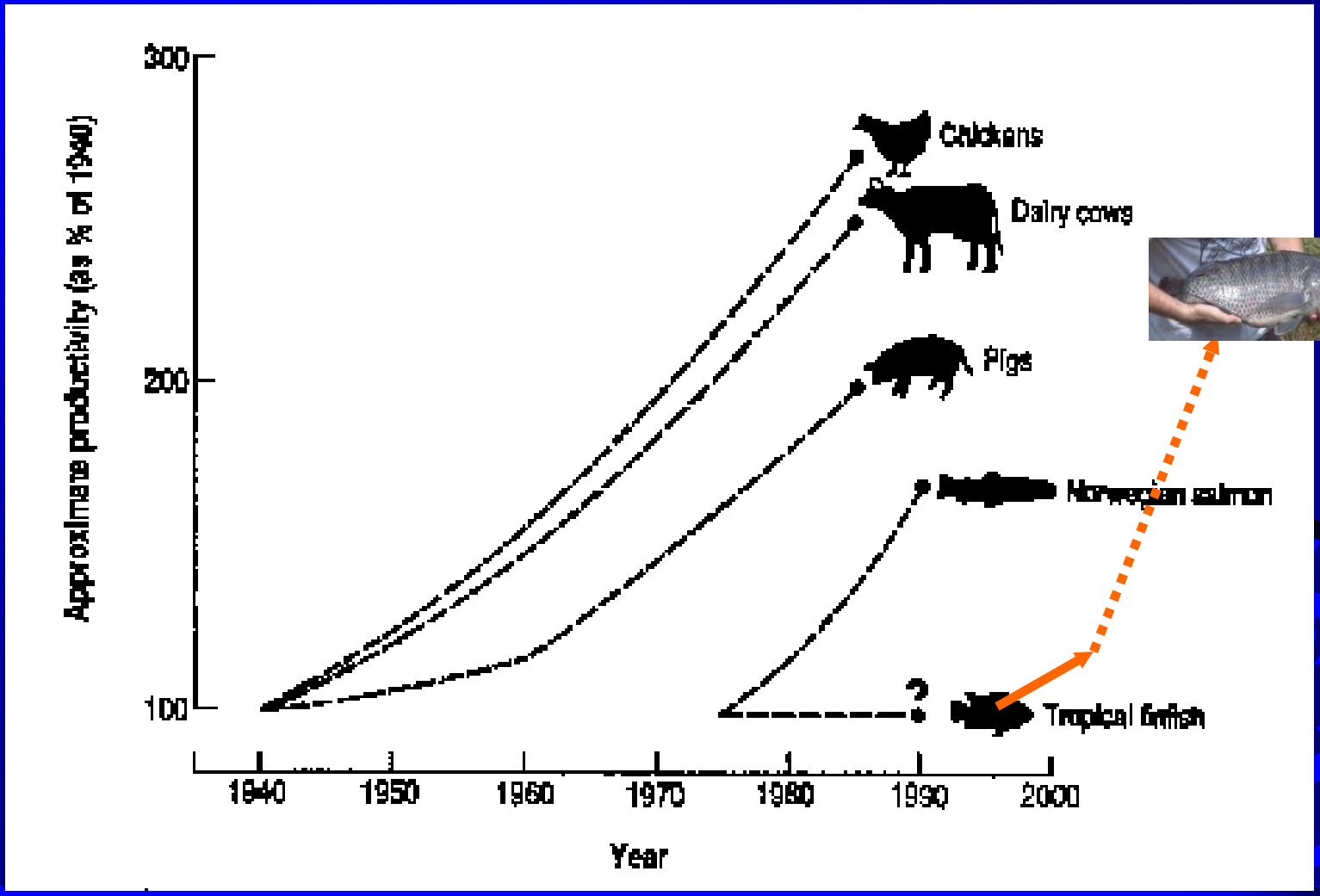
- Breeding programs
  - G.I.F.T. - Malaysia
  - Genomar - Brazil and Norway
  - Chitralada – Thailand
  - TabTim – Thailand (CP Group)
  - GIFT Excell – Philippines
  - Molobicus - Philippines
  - GIFT Bangladesh
- YY Supermale - Philippines and Swansea, Egypt and Indonesia

Dr. Raul Ponzoni and World Fish Center program in Malaysia .



Typical spawning or fry rearing hapas

Genetic improvements in tilapia



(From: Mair, G., 2002)

Red Tilapia strains

- Red O. *mossambicus* mutants found in 1970's
- Backcrossings fixed the mutation
- Taiwan, Florida, Israeli, and Stirling (Scotland) strains were developed
- These were repeatedly out-crossed to other species (New strains in Jamaica, Arizona, Colombia, Ecuador, Thailand, China, Vietnam)
- Many red strains now available, most with high salinity tolerance


Tilapia (June 2007, Tesco, UK)
£8.99 kg
£4.08 lb
Whole Jamaican Tilapia
and Clubcard
Finest*
£12.99 kg
$18 US per kg whole fish!!!!

Tilapia Genome Project

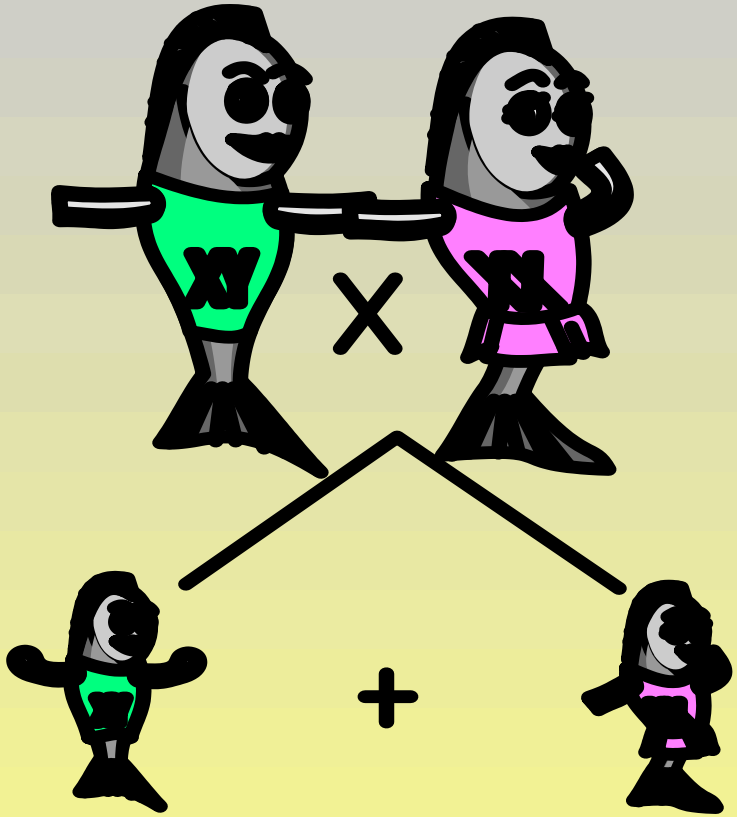
- March 2011 - First assembly of the tilapia genome
- *Oreochromis niloticus* – Nile Tilapia
- http://www.broadinstitute.org/ftp/pub/assemblies/fish/tilapia/Oreni1l/
- Matching many segments to those known from other fish
- Publically available and freely accessible
- Next frontier of genetic program for tilapia

Methyltestosterone technique

- Feed fry with food containing MT (60mg 17α-MT/kg of feed) for 21 days
- For product to be sold in US, MT feed should be purchased from approved supplier
- Females develop as males, males unaffected
- Isotope labeling studies demonstrate that MT in fish is below detectable limits 30 days after last feeding
- 90+ % develop as male fish

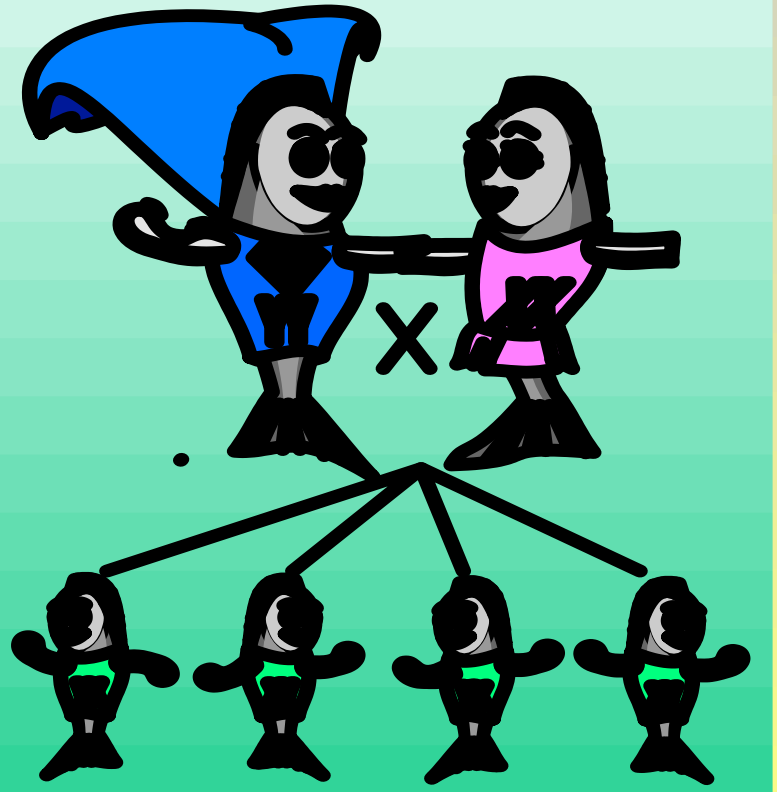
The YY male technology

THEN



Normal crosses produce equal proportion of males and females

NOW



YY males produce only male progeny (GMT®)

Regions of rapid production growth

- **Vietnam – conversion of catfish cages to tilapia in Mekong, cage culture in southern lakes, pond culture in north, some polyculture with marine shrimp**
- Egypt – Production in agricultural return waters, polyculture with mullet and carps
- Indonesia – cage culture, polycultures, rice culture
- Malaysia – government support and private sector investment
- Bangladesh – government support and private sector investment
- Brazil – lots of available water, labor, land, feed
- Thailand – better reporting, shrimp polyculture
- Mexico – continued intensification, some govt support, large and small private investments
- Sub-Saharan Africa - commercialization

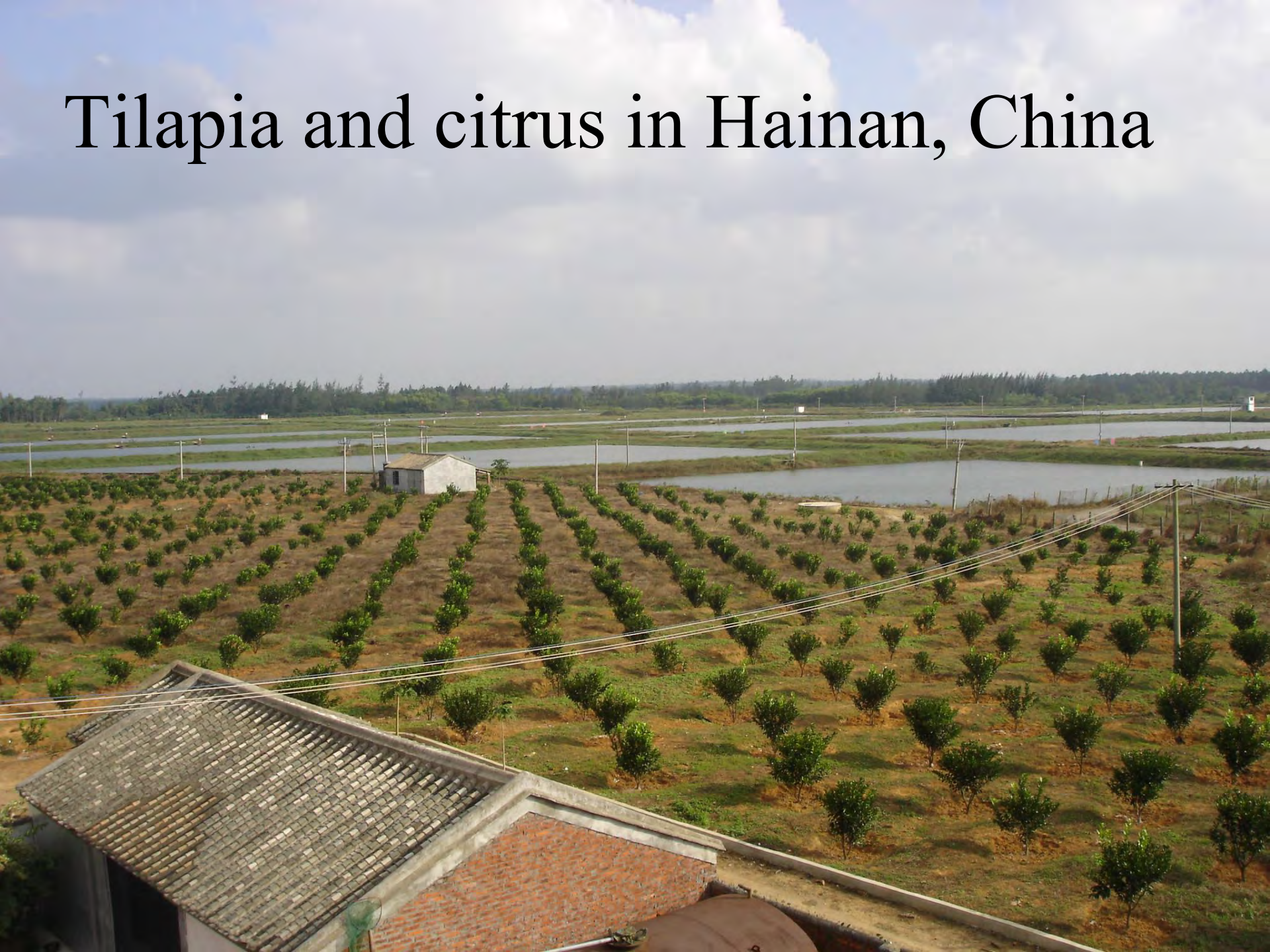
Integrated Farming Systems

- Tilapia → Grapes, wheat, olives, barley, sorghum, cotton, melons, peppers

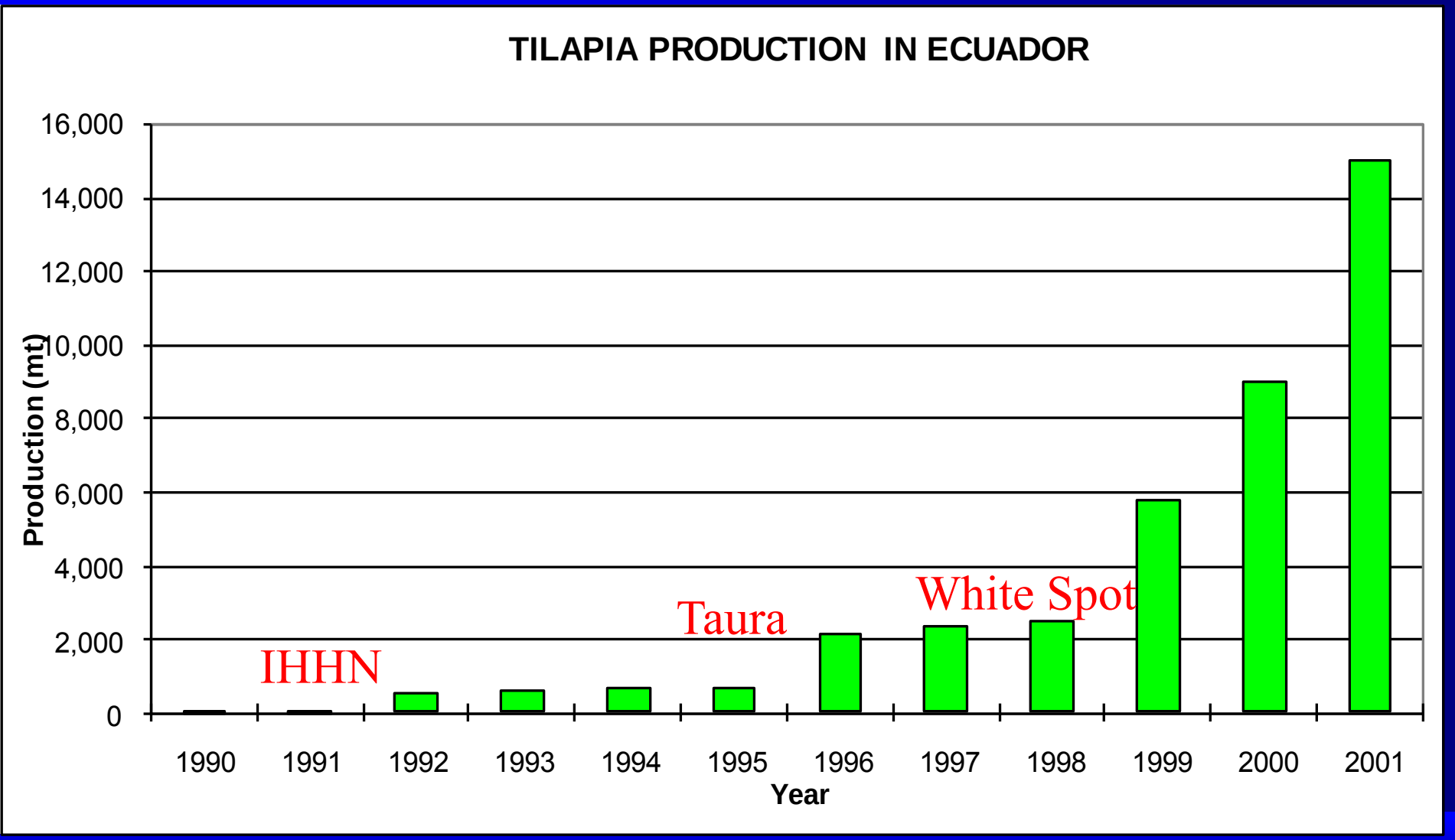
Safford, AZ

Marana, AZ

Tilapia and citrus in Hainan, China



Production of tilapia in Ecuador and viral infections viral of shrimp



Tilapia-shrimp-halophytes Eritrea

Thailand farm-based polyculture systems

- Tilapia in cages in shrimp ponds
- Tilapia in sequential polyculture before and after shrimp ponds
- Farmers testing impacts on microflora

Thailand experimental polyculture systems at AIT

- Shrimp survival - 90%
- Shrimp yield - 3,000 kg/ha
- Tilapia survival - > 90%
- Tilapia yield - 1,500 kg/ha
- Tilapia growth - 10g to 300g in 10 weeks
- Shrimp survival and yield was lower in monoculture control, but profits higher in polyculture

Polyculture Indonesia

Stocking and harvest schedule

Seaweed, milkfish and shrimp

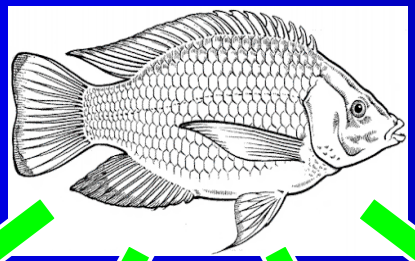

NGAN APLIKASI SISTEM PROGRESIF, PROBIOTIK DAN PROBIO
Tilapia – shrimp – seaweed polyculture in Indonesia
Pengendapan &
Penyerapan Limbah
TOM
200 ppm
Petak Udang
Petak Udang
Saluran B
VIBRIO
10^4 CFU - 10^1 CFU

Gracilaria

Shrimp

Tilapia

Pathways in the use of tilapia as biomanipulator in shrimp farms



Promotion of *Chlorella* dominance

Feeding on organic waste

Bioturbation of sediment

Production of natural antimicrobials

IMPROVED SEDIMENT QUALITY

IMPROVED WATER QUALITY

SUPRESSION OF GROWTH OF *V. harveyi*

HACCP

- Hazard Analysis at Critical Control Points
- Planning procedure for documenting good production and processing practices
- Participants operate under approved plan with audits at random frequency
- Focus is on documentation of proper activities at important stages rather than stationing a permanent inspector at farm or processing plant.
- Greater focus on critical farming, harvesting, transport, processing and storage steps.
- More cost effective

HACCP

- Examples:
- Document feed source and use, applications of drugs and chemicals, farm water quality, testing for off-flavor
- Document source, arrival time, temperature and condition of fish as they arrive at process plant
- Provide footbaths, hand washes and protective clothing for processing workers, document usage by having employees sign daily log
- Measure and record bacterial numbers on fillets during quality control
- Traceability

Meeting buyer specifications

- Identify buyers before stocking fish
- Have agreements on size, quantity, quality, packaging, shipping, price, and finance terms
- Be aware that processor, importer, wholesaler, retailer, and consumer demands are constantly increasing.
- Prices do not increase although costs do

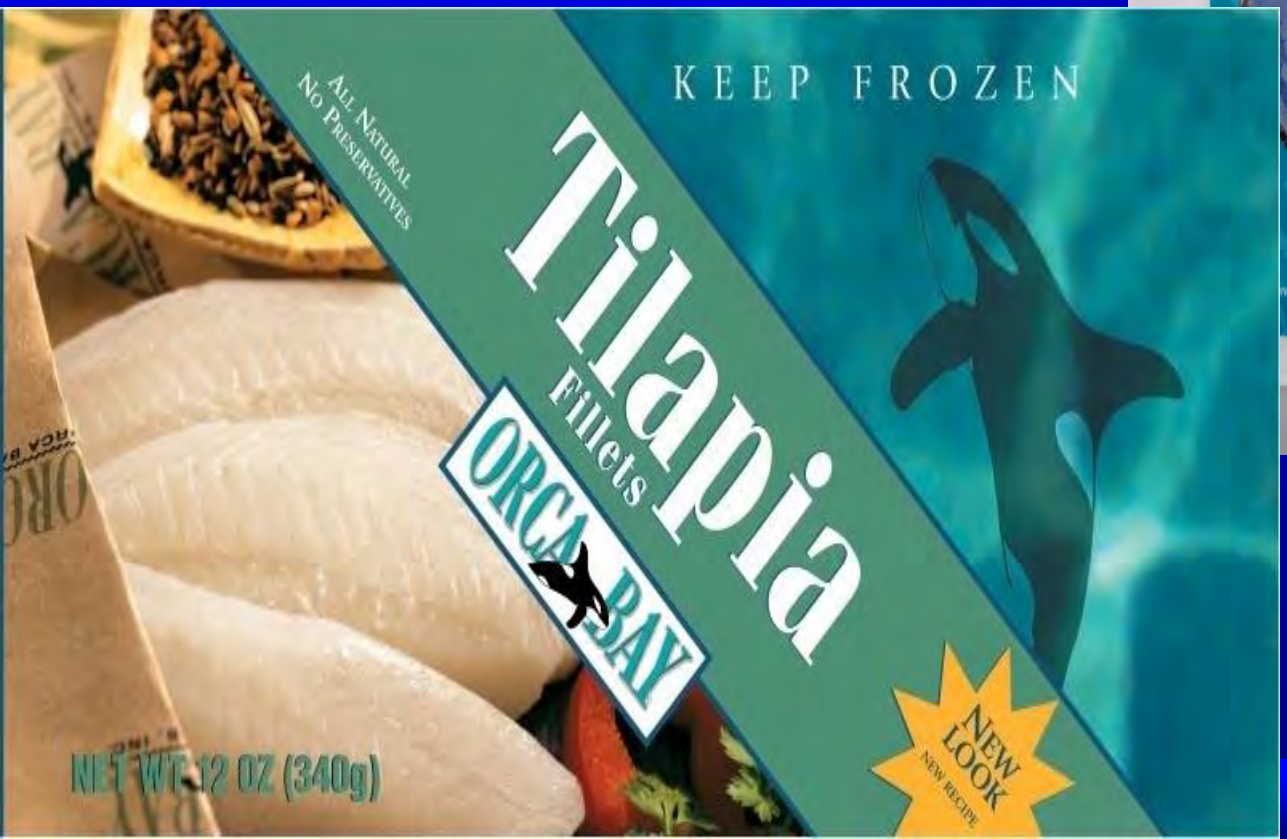
Gaining NGO certifications

- NaturLand
- World Wildlife Fund – Aquaculture Stewardship Council
- Aquaculture Certification Council
- Global GAP

- And then there are National programs
- Each reviewing sustainability of aquaculture practices and providing a certification and marketing logo

Improvements in packaging

IQF Fillets in re-sealable packages




Ocean
Tilapia
Fillets
Tropische zoetwatervis
Poisson d'eau douce tropical
Tropical freshwater fish
Tropischer Süßwasserfisch
Tropisk ferskvannsfisk
Tropisk sötvattensfisk


ANOVA
Gourmet
Tilapia
2


Tilapia
Tilapia
7.9


Tilapiafilet
(min. 4 stuks)


All Tilapia are not created equal
Natural TiLoveYa ™ for
lovers of healthy food
TiLoveYa
Boneless & Frozen
Fresh Tilapia Fillets
Lemon-Dill
Serving Suggestion Enlarged to show texture


TiLoveYa
FARM RAISED
All Tilapia are not created equal,
Natural TiLoveYa® for lovers of healthy food


TiLoveYa
Boneless &
Fresh Frozen Fillets
SKIN ON
GRILL FOR BARBECUE
KEEP FROZEN
Tilapia
All Tilapia are not created equal,
Zero Toxin TiLoveYa,
for lovers of healthy food
As seen on "Business and Beyond"
and "World Business Review" with Alexander Haig
Available Packages
HQ Sustainable Maritime Industries, Inc.


TiLoveYa
GUTTED & SCALED
Frozen Tilapia
All Tilapia are not created equal,
Zero Toxin TiLoveYa,
for lovers of healthy food
As seen on
"Business and Beyond"
and "World Business Review"
with Alexander Haig
HQ Sustainable Maritime Industries, Inc.


TiLoveYa
Boneless &
Fresh Frozen Fillets
Tilapia
All Tilapia are not created equal,
Zero Toxin TiLoveYa,
for lovers of healthy food
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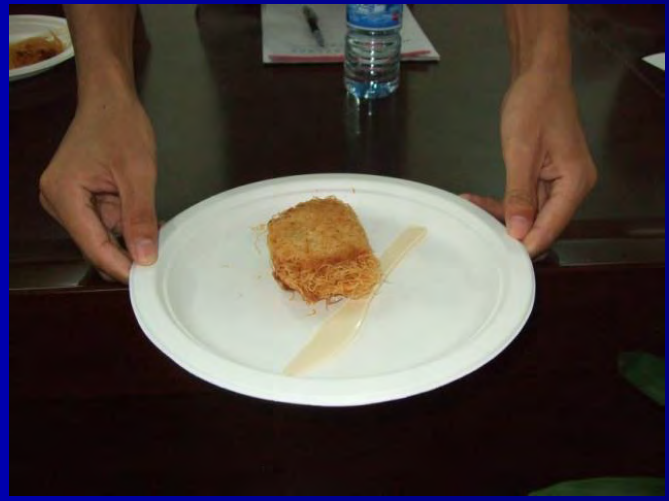
Value added meals



RESEALABLE

High Liner

MILD TASTING

Tilapia Loins

Lean-cut,
individually vacuum packed

MICROWAVEABLE

- NO Additives
- NO Preservatives
- NO Carbohydrates

NET WT. 40 oz (2.5 lb.) 1.13 kg

Sit at Captain High Liner's table and you will enjoy the very best in premium seafood. According to tradition, "High Liners" refers to the most respected captains in the fleet, whose intimate knowledge of the sea leads them around the world to find the best catch of the day. Captain High Liner's seafood products are prepared with the finest ingredients and reflect the discriminating taste of contemporary cuisine. Tilapia Loins are hand-cut from the finest part of the fillet with no preservatives added. Pull up a chair at the Captain's table, where only the most premium quality seafood makes the "cut."

Captain High Liner guarantees it!

Captain High Liner

COOKING INSTRUCTIONS

For best results and quality please follow these cooking instructions.

Keep frozen until ready to prepare – Do not refreeze

CONVENTIONAL OVEN

- Preheat oven to 400°F. Remove tilapia(s) from vacuum pack and place in a cooking pan.
- Brush tilapia(s) with butter and sprinkle with seasoning or your favorite seasoning.
- Bake for 15 minutes or until done. Fully cooked fish is opaque and flakes easily with a fork. Let stand for 2 minutes then serve.

NOTE: Can complete any style of cooking times and thickness.

MICROWAVE OVEN

- Remove tilapia(s) from vacuum pack. Place in microwave-safe container. Lightly brush with butter and sprinkle with lemon pepper, or your favorite seasoning. Cover with microwaveable plastic wrap.

NUMBER	TOTAL COOKING TIME ON HIGH
1 (280°)	2-3 minutes
2	3-4 minutes
3	5-6 minutes

- Fully cooked fish is opaque and flakes easily with a fork. Let stand for 2 minutes then serve.

NOTE: Cooking times will vary by oven model and wattage.

CAPTAIN'S FAVORITE RECIPE

Baked Mediterranean Tilapia – Serves 4

- 4 Tilapia Loins
- 1 large or 2 medium plum tomato, diced (1/4" thick)
- 2 Medium onions, diced (1/4" thick)

1. Preheat Oven to 350°F.
2. Heat and sauté onions 3/4" thick. Saute in olive oil for two minutes over medium heat (1-2 minutes each side or until onions are translucent).
3. Place tilapia over sliced onions. Sprinkle with garlic and basil over fish. Place tomato slices on the fish and pepper to taste.
4. Place pan with fish in oven (baking times will vary depending on oven). Bake for 15 minutes or until fish is opaque and flakes easily with a fork.

Serve tilapia with rice pilaf and spinach salad.

- Sea fresh mustard basil, or 2 Tbsp dry basil
- 3 Cloves chopped garlic
- 1 Tbsp olive oil
- 12 Calamata olives, chopped

about TILAPIA

Superior Quality & Taste!

Tilapia is a delicious, mild tasting, white and flaky fish that has recently been discovered by North Americans. Because of tilapia's excellent taste, texture and versatility, it is rapidly becoming one of the most popular fish among consumers. High Liner brings you the very best tilapia, raised in lakes in Indonesia that are fed by pristine, mountain spring waters. They are cut into thick loins for a consistently mild and mouthwatering taste experience every time!

Nutrition Facts

Serving Size 4 oz (113 g, about 3/4 – 1 fillet)
Servings Per Container Varied (6–10)

Amount Per Serving	
Calories 110	Calories From Fat 15
	% Daily Value*
Total Fat 2g	3%
Saturated Fat 1g	5%
Trans Fat 0g	
Cholesterol 25mg	9%
Sodium 25mg	1%
Total Carbohydrate 0g	0%
Dietary Fiber less than 0g	0%
Sugars 0g	
Protein 23g	
Vitamin A 0%	Vitamin C 0%
Calcium 4%	Iron 6%

* Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300mg	375mg
Dietary Fiber		25g	30g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

This bag is packed by net weight, not by count. The product in this package is made from tilapia loins of varying sizes. The package may contain anywhere from 6 to 10 individual tilapia loins. Fewer loins in the bag do not mean less weight in the package.

INGREDIENTS: TILAPIA

Distributed by
High Liner Foods (USA), Inc.
Portsmouth, NH 03802-0819
www.highlinerfoods.com

PRODUCT OF INDONESIA
FARM RAISED TILAPIA

Best if Used By


Ready to cook gourmet seafood
Sea Cuisine™
Natural Cut Crusted Fillets
TORTILLA CRUSTED TILAPIA
with Chipotle & Lime
NET WT. 2 LB (907g)
KEEP FROZEN
SERVING SUGGESTION


TRUSTED SINCE 1849
GORTON'S
NEW!
Premium Fillets
Tilapia
CRUNCHY BREADED FISH FILLETS
GORTON'S FIVE STAR TILAPIA
Serving Suggestion
KEEP FROZEN
NET WT 17.2 OZ. (488 g)


Oven Poppers
From Our Kitchens To Your Home
Tilapia
Stuffed with Sun Dried Tomato, Shrimp & Lobster
Carbs 8g Protein 19g
2 5 oz. servings of hand-selected stuffed fish fillets
Premium Choice ENTREE
NET WT. 10 OZ. (284g) • KEEP FROZEN • LESS THAN 200 CALORIES PER SERVING

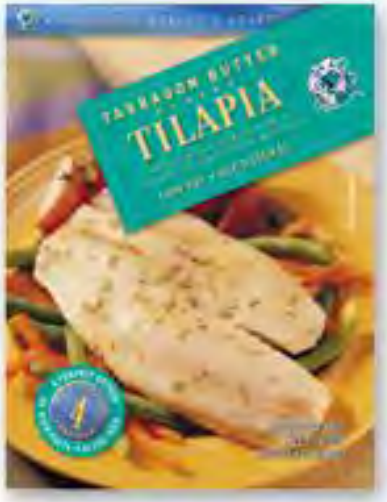

High Liner
SEAFOOD SELECTS™
PRIMAVERA TILAPIA
Tilapia and spring vegetables in a garlic butter sauce
ALL NATURAL INGREDIENTS
SEAFOOD IS GOOD FOR YOU
ENLARGED TO SHOW TEXTURE
NET WT 32 oz (2 lbs) 907 g


Farm Raised
SKINLESS BONELESS
Tilapia


TUSCAN STYLE TILAPIA
topped with fresh tomatoes, black olives, parmesan cheese & pesto
QUAY
NO 5


SHRIMP CO
NEW!
Sea Pak
SHRIMP CO
ARTICHOKE PESTO
TILAPIA
Tilapia fillets topped with a generous mix of diced artichoke hearts, roasted red pepper, garlic, and fresh basil, with olive oil, lemon juice, spices and Parmesan cheese.
naturals
2 All-Natural Fillets
NO ADDITIVES
NO PRESERVATIVES
Oven or Grill!
204mg Omega-3 fatty acids per serving
SERVING SUGGESTION
KEEP FROZEN
NET WT. 12 OZ. (340g)


Air Tahiti Nui
TILAPIA W/ BBQ SAUCE



ONE-STEP SEAFOOD FILLETS

Tarragon Butter Tilapia
Deep skinned tilapia fillets glazed with a delicate tarragon butter marinade. Individually vacuum packed. 12 oz. bag.

Savory Seafood Grille

Cajun Creole TILAPIA

Our tender Tilapia is slow cooked in delicious Cajun Creole seasonings, and made easy to cook & serve, putting an irresistable meal on your table in less than ten minutes!

SimpleSteps

4 OZ. RETAIL BAGS

These *Grab & Go* bags are a great addition to any seafood program!

SAVORY Grab & Go!

Savory Seafood Grille Mahi & Tilapia in 4 oz. bags are *A Fresh New Way* to create sales-driving, price-point promotions that your customers will love!

5 FOR $5 -OR- 10 FOR $10!

GREAT SALES ITEM!

Mahi Mahi Tilapia

ALL NATURAL BREADED TILAPIA FILLETS

Excellent Price!
Great Availability!

Flakey Inside!
Crispy Outside!

Popular White Meated Fish
Great For Dinners, Sandwiches, and Buffets!

Retail 2lb. Box

Top View

Back View

Side View

For Prices Click Here

Traditional product forms

Yangon BBQ tilapia

New product forms

Smoked tilapia

Sashimi grade tilapia

Tilapia and food service

- On almost all cruise ships
- Starting to appear on airlines
- Increasingly with schools, hospitals and prisons
- Several prisons have their own tilapia farms

Courtesy: Eric Roderick

American Airlines 14 Jan 2011- Chicago - Delhi

Tilapia in Long John Silver's

McDonald's and other fastfoods could double tilapia global demand

Byproducts - Tilapia Leather

Manolos, Now Available In Tilapia

January 20, 2012 4:35 pm

Manolos made from discarded tilapia skin, raffia, and cork? Why not. Until now, the shoemaker hadn't delved into the green scene, but eco-chic designer Marcia Patmos was able to change that. "They were very open and loved my suggestion of bringing sustainability into the shoes, as long as I could find the right materials that they couldn't supply," Patmos tells Style.com. So, she settled on natural resources and fish industry byproducts for the Spring '12 collection. "The materials were actually very easy to work with," Patmos adds. "Mixed together or dyed, they're very versatile." The heels ($975) and the flats ($645) are hitting Manolo stores next week. Patmos revealed she's already hard at work on the next round—an ankle bootie made of vegetable tanned leather—for the the Fall '12 Manolo Blahnik for M.Patmos collection.

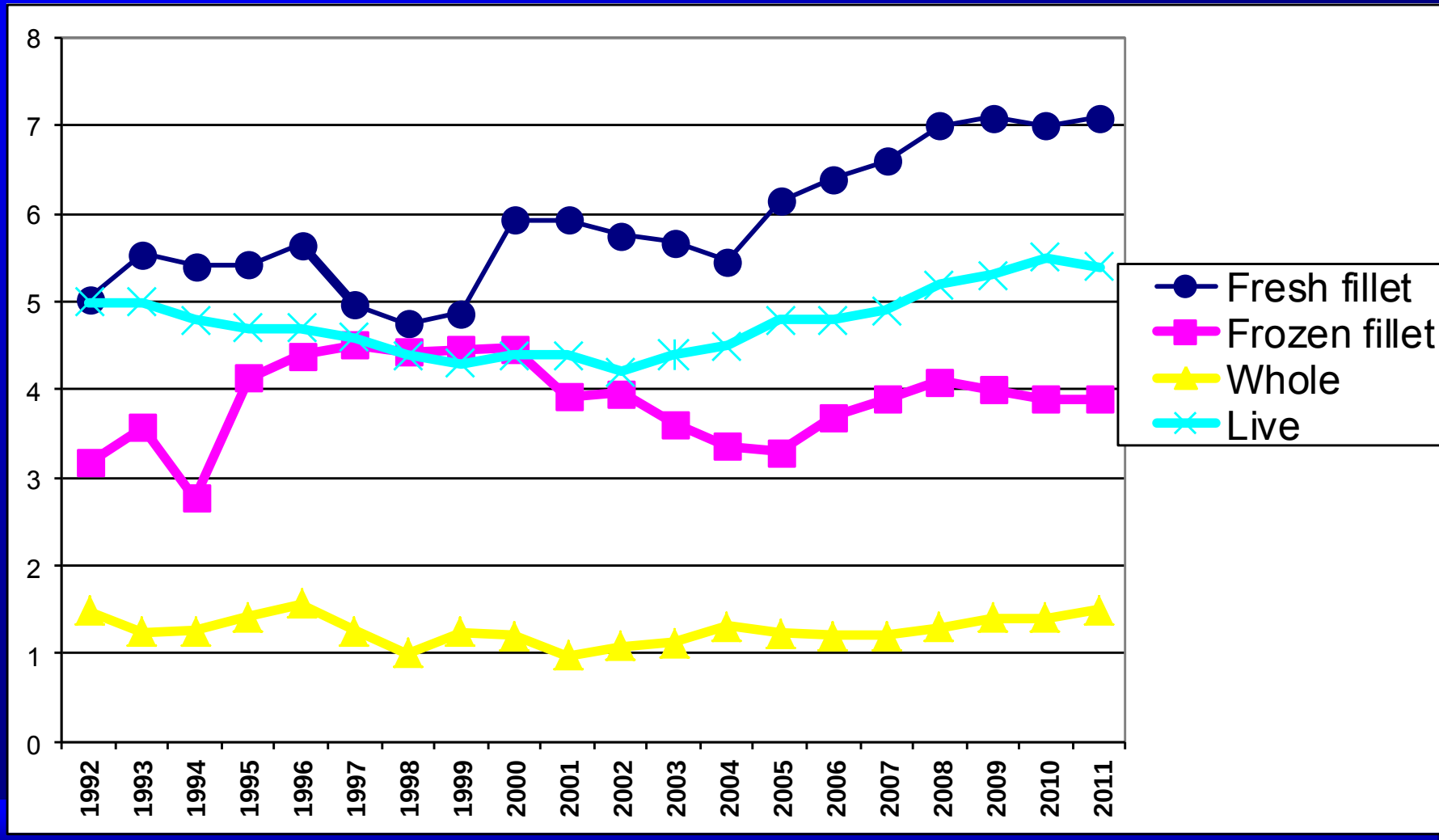
—Kristin Studeman

Health and Beauty Products

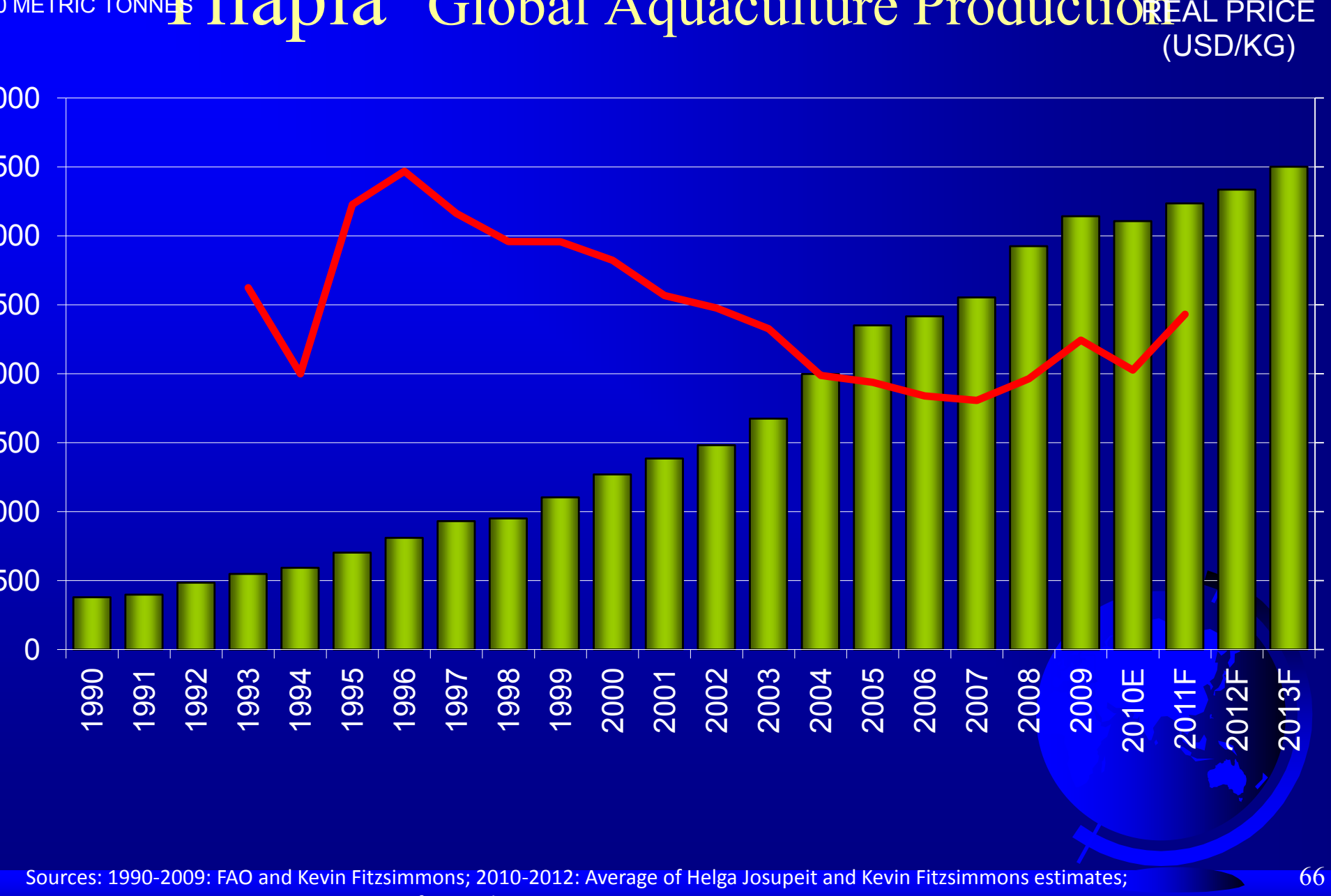
Tilapia Orange Juice

Global Tilapia Market Trends

Prices have been constant, only fresh fillets have increased significantly, will not see increases beyond inflation



Tilapia Global Aquaculture Production

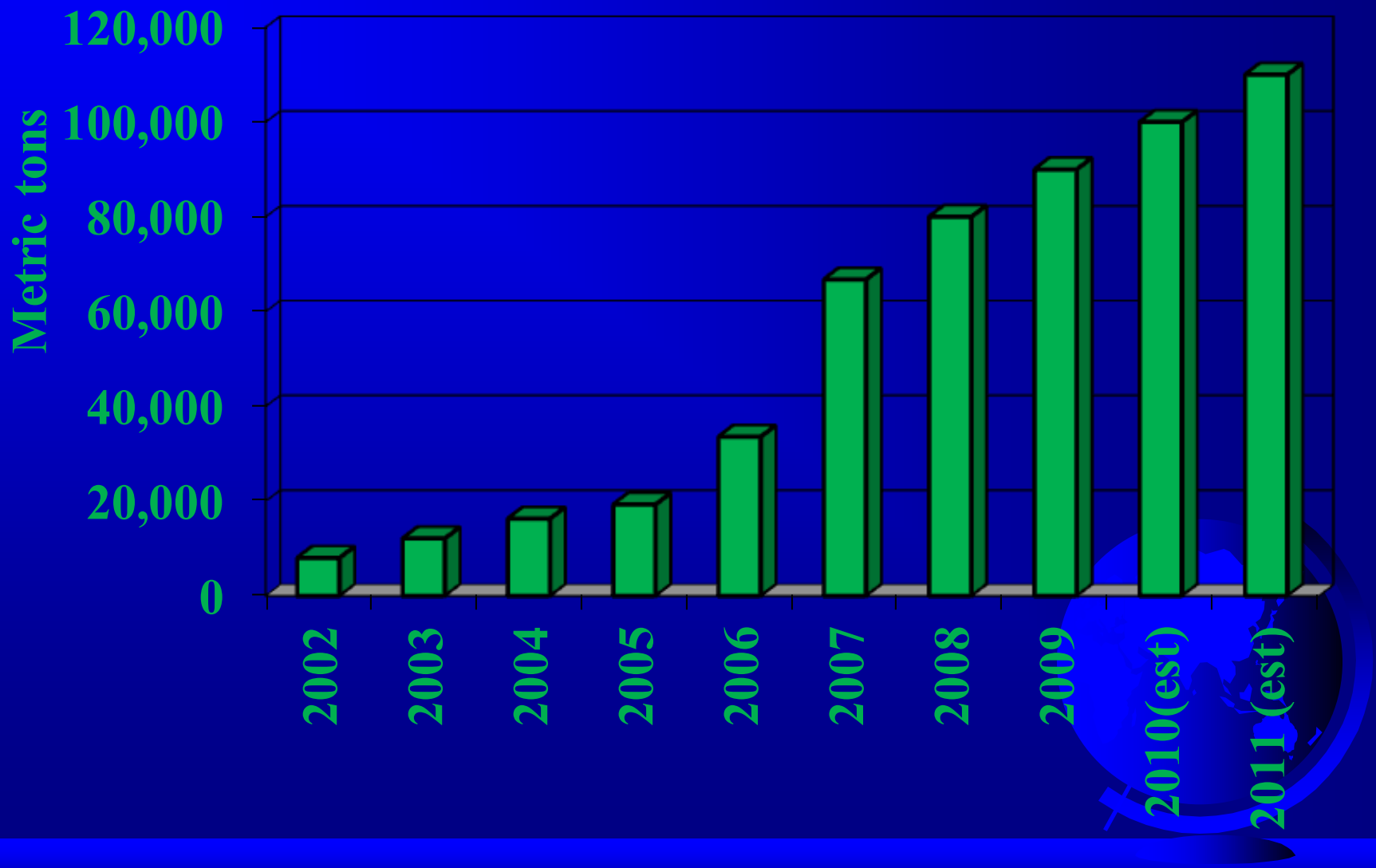


Sources: 1990-2009: FAO and Kevin Fitzsimmons; 2010-2012: Average of Helga Josupeit and Kevin Fitzsimmons estimates; 2013: Kevin Fitzsimmons; Prices US import frozen tilapia Jan- Jun: NMFS

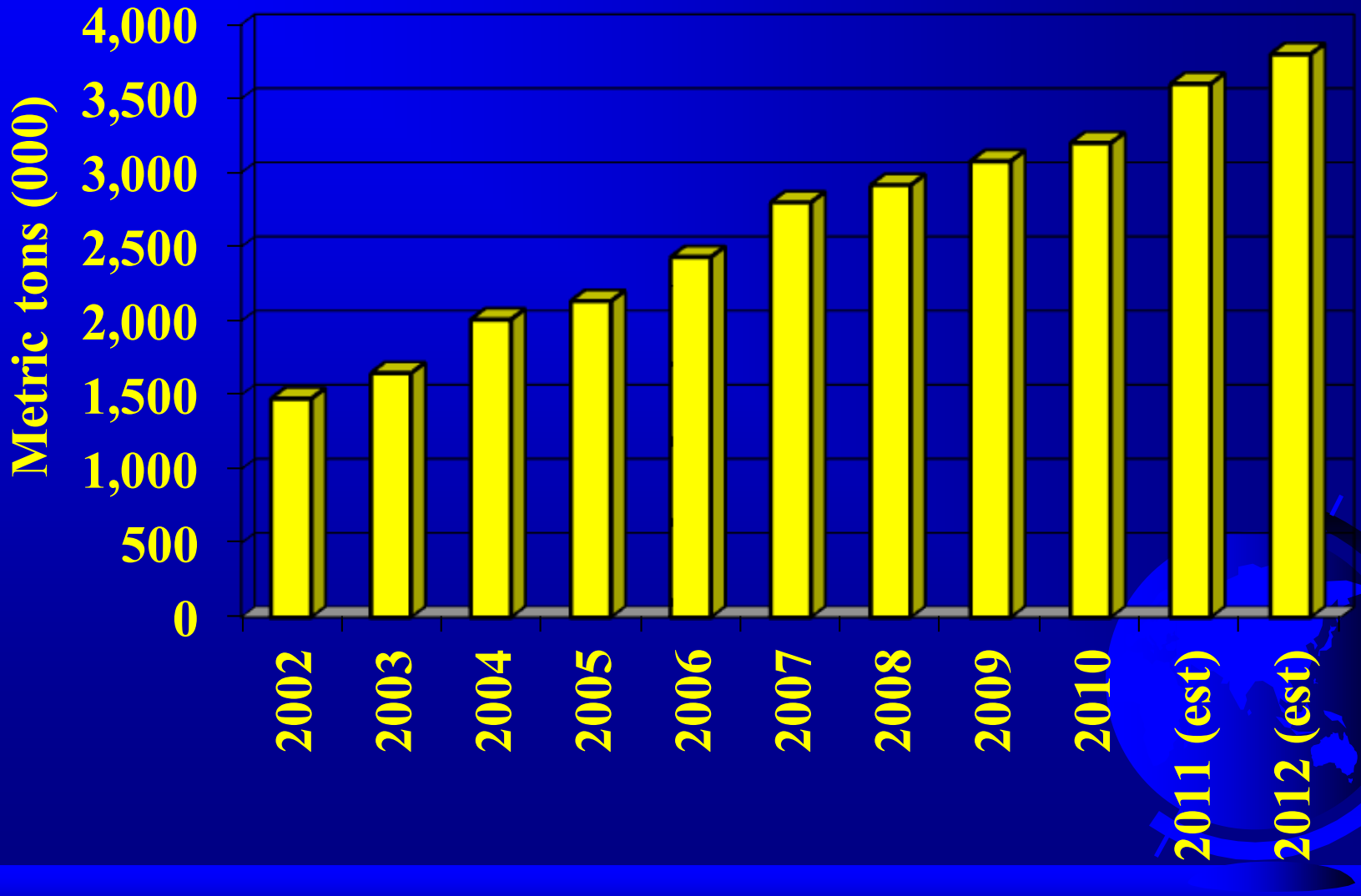
Global Aquaculture Tilapia Sales

- For year 2000 =US $ 1,744,045000
  (FAO FishStat 2007)
- 2005 sales = $ 2,457,312,000
  (FAO FishStat 2007)
- 2010 sales >$ 5,000,000,000

Bangladesh tilapia aquaculture



Future global tilapia aquaculture



Conclusions

- Global tilapia production was around 3,600,000 metric tons in 2011, should exceed 3,700,000 MT in 2012.
- Constantly improving farming, processing and packaging for food safety, quality assurance, traceability, and environmental safeguards (with little, if any, increase in price).
- Other aquaculture species will follow the tilapia model.

Conclusions

- Tilapia has long been called the aquatic chicken.
- Instead……
- The “terrestrial tilapia”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ARIZONA
TILAPIA
GRAND CANYON STATE
Thank you!
Questions?