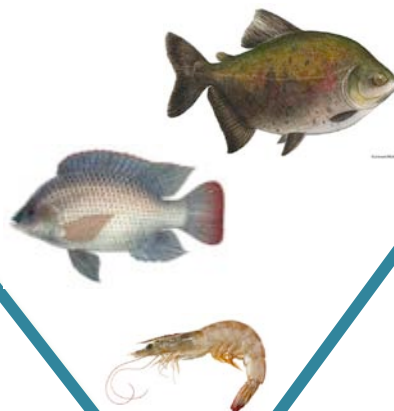


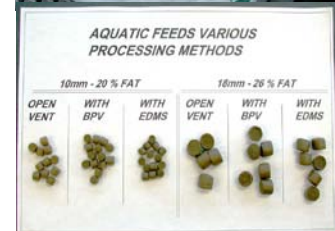


Aquicultura: Desafios e Oportunidades na Revolução Azul Brasileira

Aquicultura no mundo e importância para a nutrição humana



USP



AQUATIC FARMS

Albert G.J. Tacon PhD

LAM-USP Visiting Scientist

Aquatic Farms Ltd

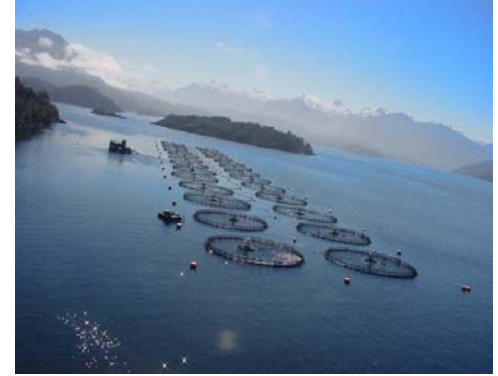
Kaneohe, HI 96744 USA

agjtacon@aquahana.com

<http://www.aquahana.com>



Aquaculture's contribution to global food supply



AQUACULTURE

the farming of aquatic animals & plants

has been the world's fastest growing food sector for 25 years
& is considered as an important weapon in the global fight
against **malnutrition** as a provider of much needed
high quality protein & other essential nutrients



Aquaculture has been fastest growing food sector for over 30 years, with an APR of 8.0%/year, compared with 0.6% for capture fisheries and 2.6% for total agricultural meat production (FAO, 2016)

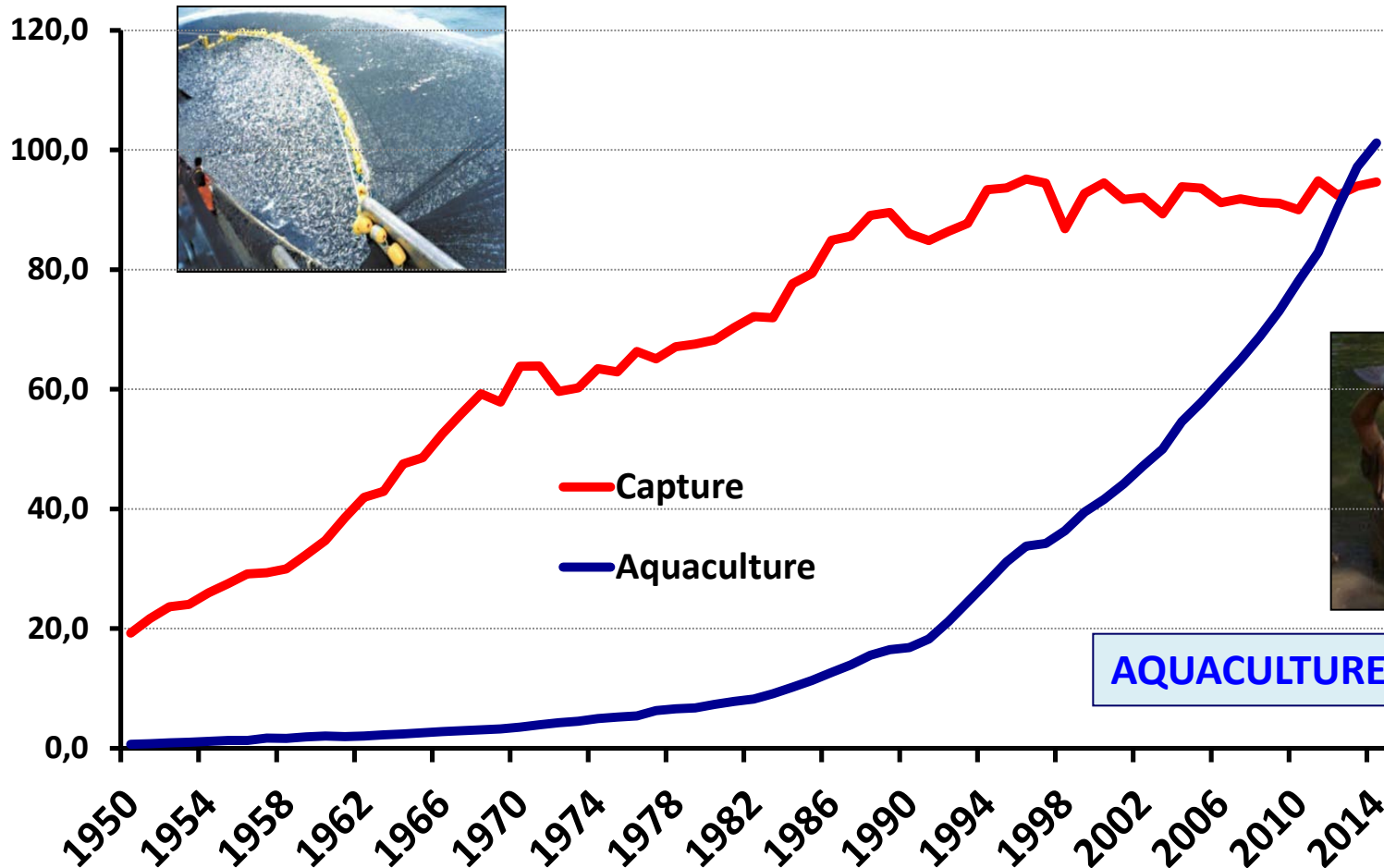
Million
Tonnes

CAPTURE FISHERIES - HUNTING

2014

101.14 Mt

94.64 Mt



AQUACULTURE - FARMING

Finfish

Molluscs

Crustaceans

Aquatic plants

240 Fed species

210



63



30



15



>318 SPECIES

Cereals

Fruits & nuts

Roots & tubers

Oilseeds & pulses

Vegetables

Livestock

18 Fed species

10



48



26



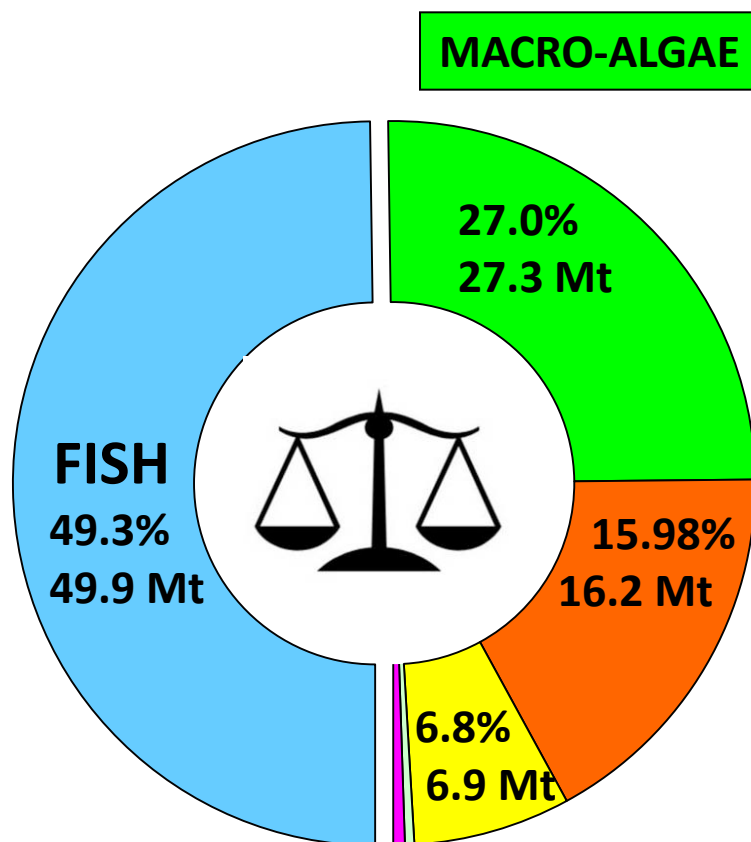
18



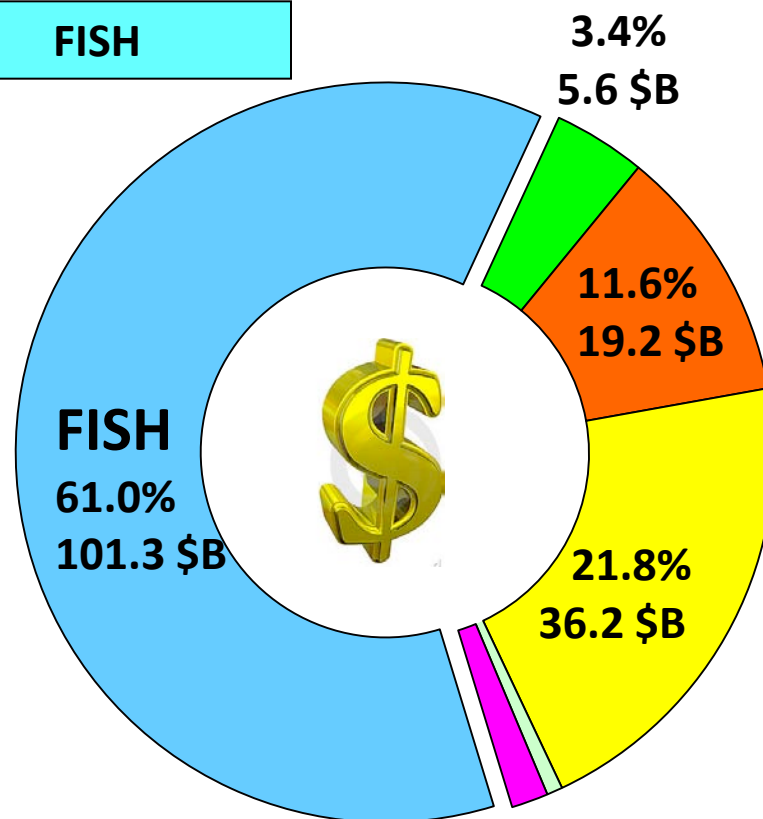
>158 SPECIES

Aquaculture production by major species group in 2014

(values given in million metric tonnes & US \$ billion; FAO, 2016)



By weight
101.14 Million tonnes



By value
166.02 US \$ Billion

MOLLUSCS

CRUSTACEANS

AQUATIC INVERTEBRATES

AMPHIBIANS & REPTILES

Total aquaculture production by region & economic class

(For 2014; values given in metric tonnes; FAO, 2016)

ASIA (mt) 92,763,147

AMERICAS 3,365,210

EUROPE 2,933,146

AFRICA 1,861,271

OCEANIA 216,297

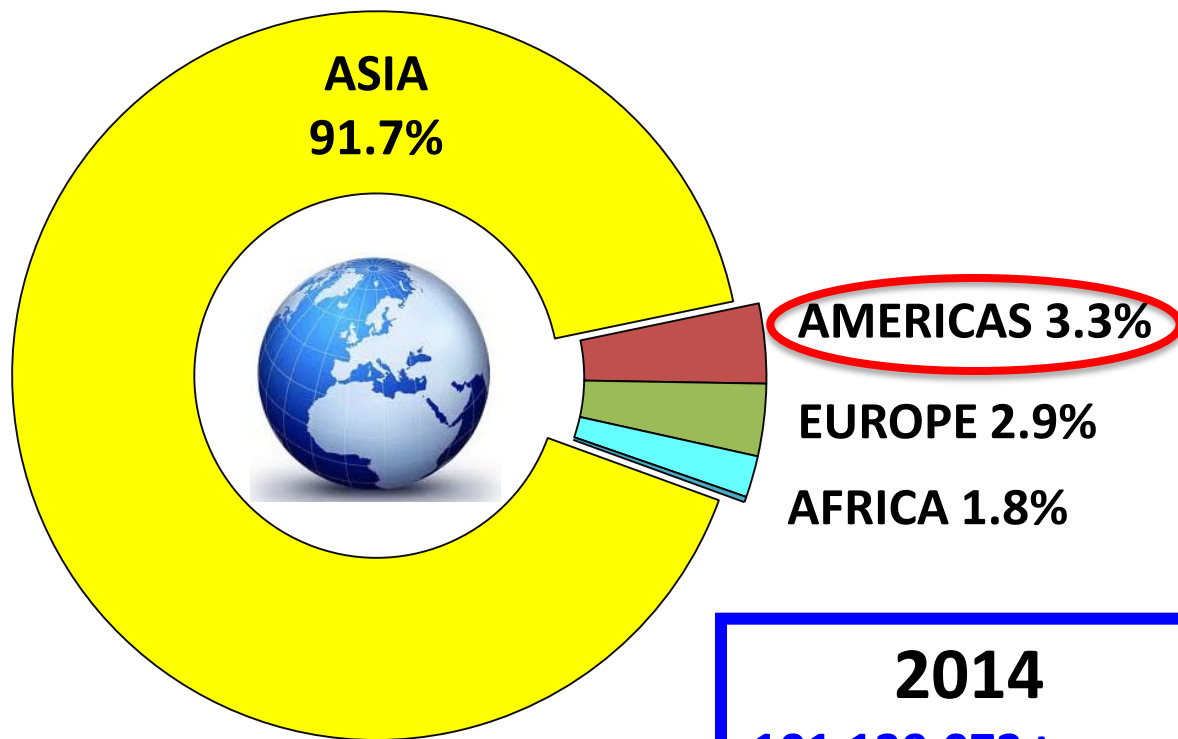
ASIA (APR) 6.6

AMERICAS 6.2

EUROPE 2.6

AFRICA 10.6

OCEANIA 3.2



2014
101,139,072 tonnes

DEVELOPING COUNTRIES

96,374,378 (95.3%)

APR 6.9%

DEVELOPED COUNTRIES

4,764,694 (4.7%)

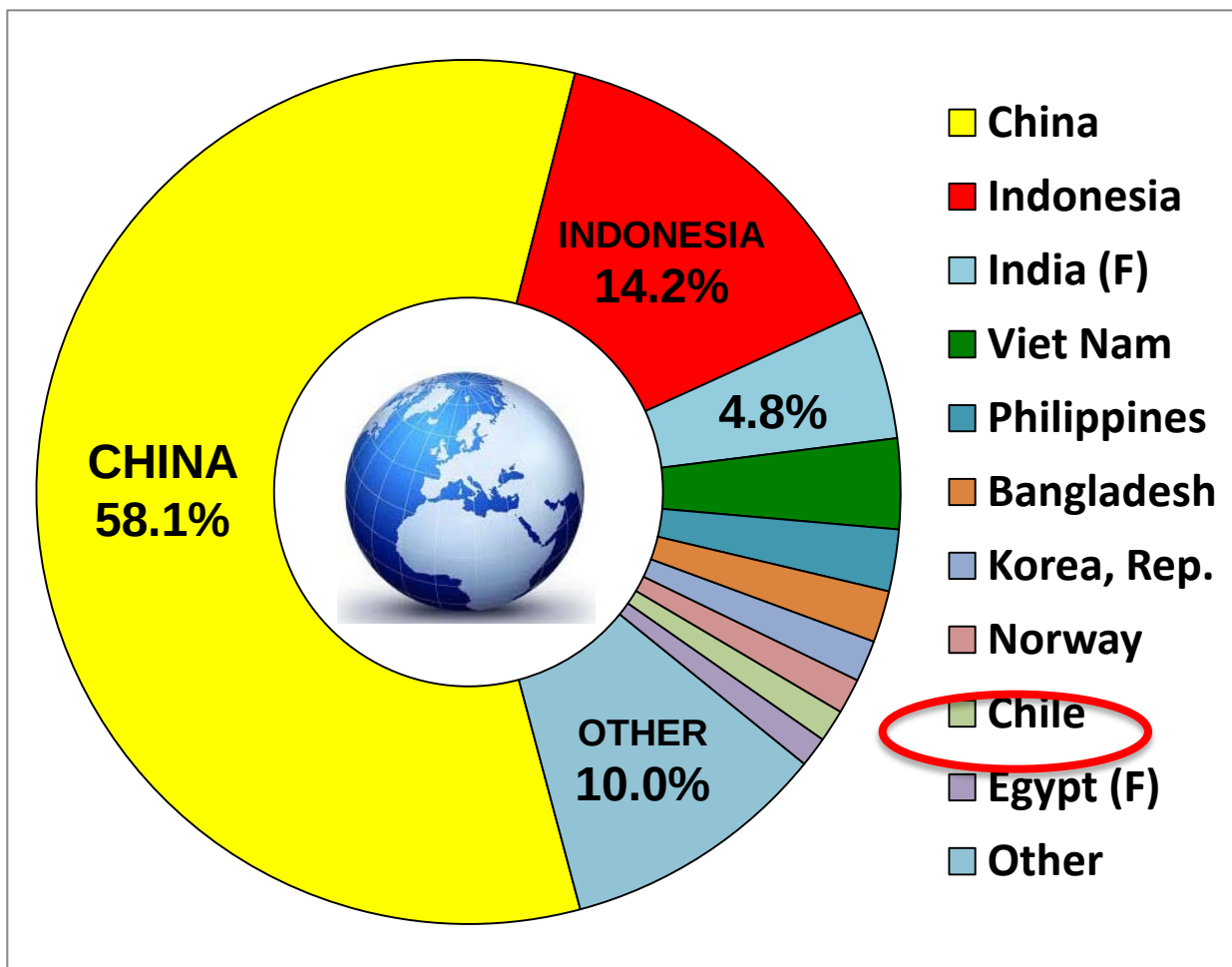
APR 1.1%

All APRs calculated from 2000 to 2014

Total aquaculture production by country in 2014

(values given in metric tonnes; FAO, 2016)

China	58,797,258
Indonesia	14,375,282
India (F)	4,884,021
Viet Nam	3,411,391
Philippines	2,337,605
Bangladesh	1,956,925
Korea, Rep.	1,567,442
Norway	1,332,497
Chile	1,227,359
Egypt (F)	1,137,091
Other	10,112,201



Top aquaculture **country** producers – 2014

(metric tonnes; APR % 2000-2014; FAO, 2016)

Top 10 **countries**

1 China	58,797,258	(5.3%)
2 Indonesia	14,375,282	(21.0%)
3 India	4,884,021 F	(6.8%)
4 Viet Nam	3,411,391	(14.5%)
5 Philippines	2,337,605	(5.5%)
6 Bangladesh	1,956,925	(8.1%)
7 Korea, Rep.	1,567,442	(6.8%)
8 Norway	1,332,497	(7.4%)
9 Chile	1,227,359	(7.9%)
10 Egypt	1,137,091	(9.0%)

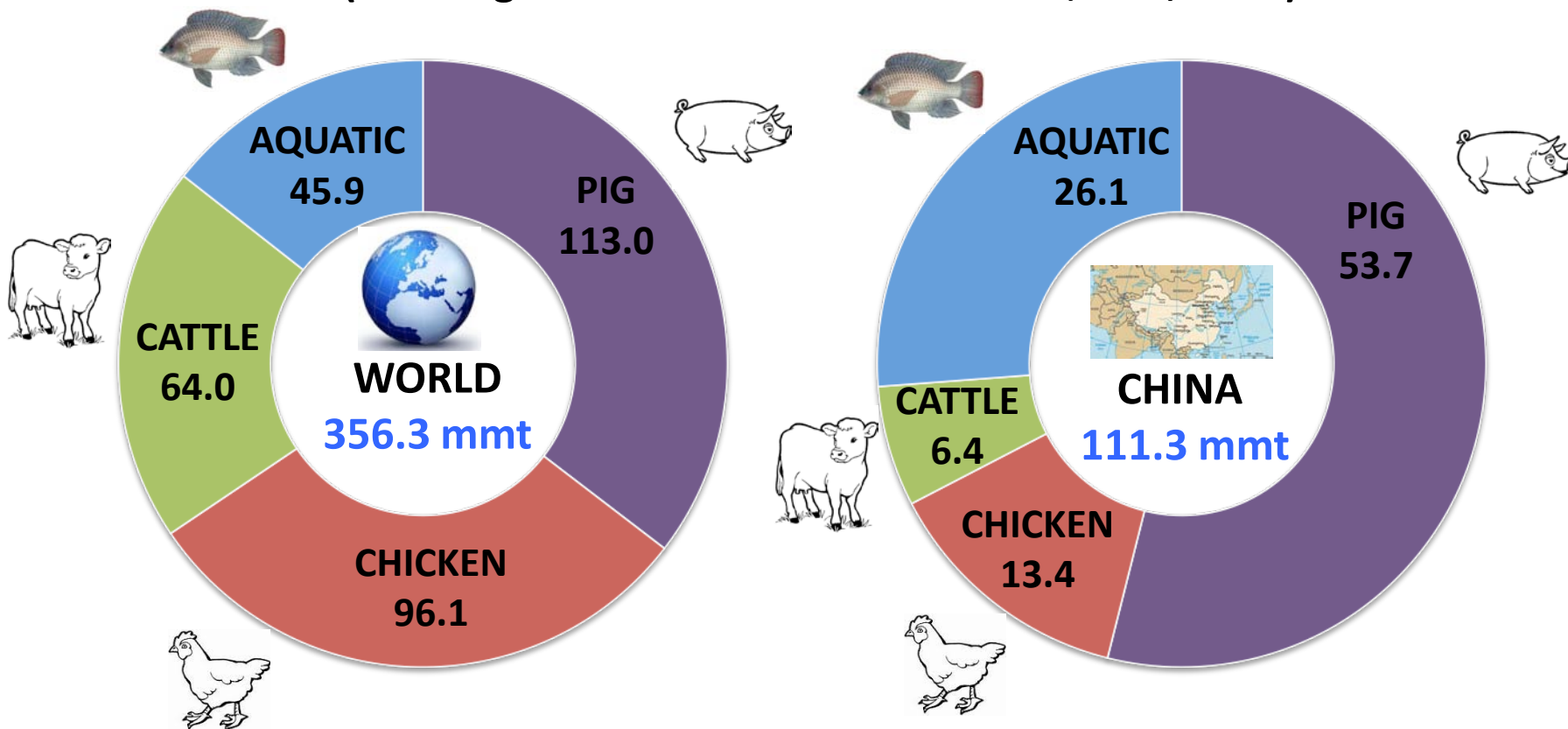
Top 11-20 **countries**

11 Japan	1,020,420	(-1.7%)
12 Myanmar	964,256	(17.7%)
13 Thailand	934,758	(1.7%)
14 Brazil	562,533	(8.8%)
15 Malaysia	521,014	(8.4%)
16 Korea DPR	508,450 F	(0.6%)
17 USA	425,870	(-0.5%)
18 Ecuador	368,207 F	(13.7%)
19 Taiwan	340,567	(2.0%)
20 Iran	320,174	(15.9%)

Total production 101,139,072 tonnes,
valued at **US \$ 166.02 billion**

GLOBAL FARMED MEAT PRODUCTION – WORLD & CHINA

(Values given in million metric tonnes; FAO, 2016)



Aquaculture supplied 45.9 million tonnes of farmed aquatic meat in 2013 (APR 7.40%), compared with 71.8 million tonnes from wild capture fisheries (APR 0.25%), and 310.4 million tonnes of terrestrial meat production (APR 2.46%). In China aquaculture supplied 26.1 million tonnes of farmed aquatic meat (APR 7.33%), compared with 85.2 million tonnes of terrestrial meat production (APR 4.06%; FAO, 2016)

NUTRITION is the **cornerstone** that effects the **health & wellbeing** of **all people: both rich & poor**



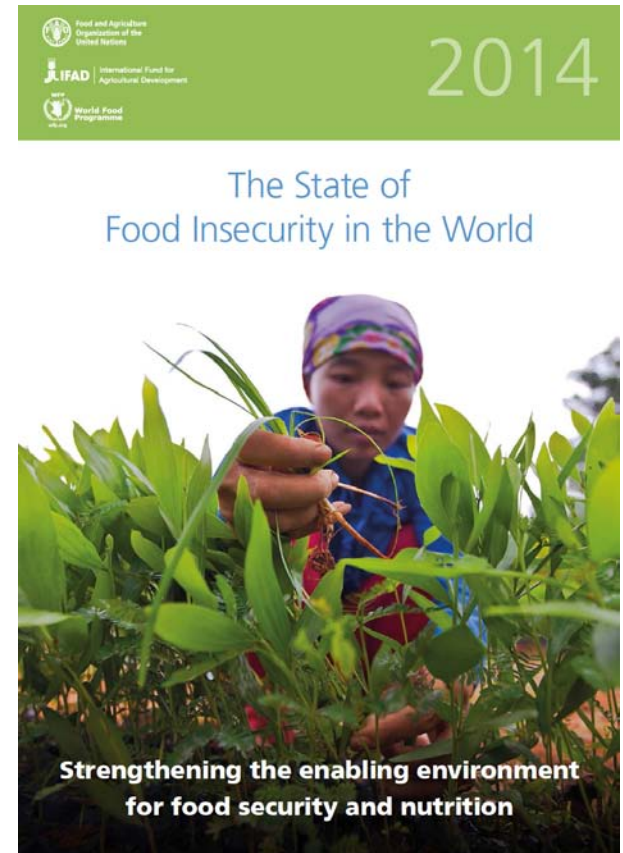
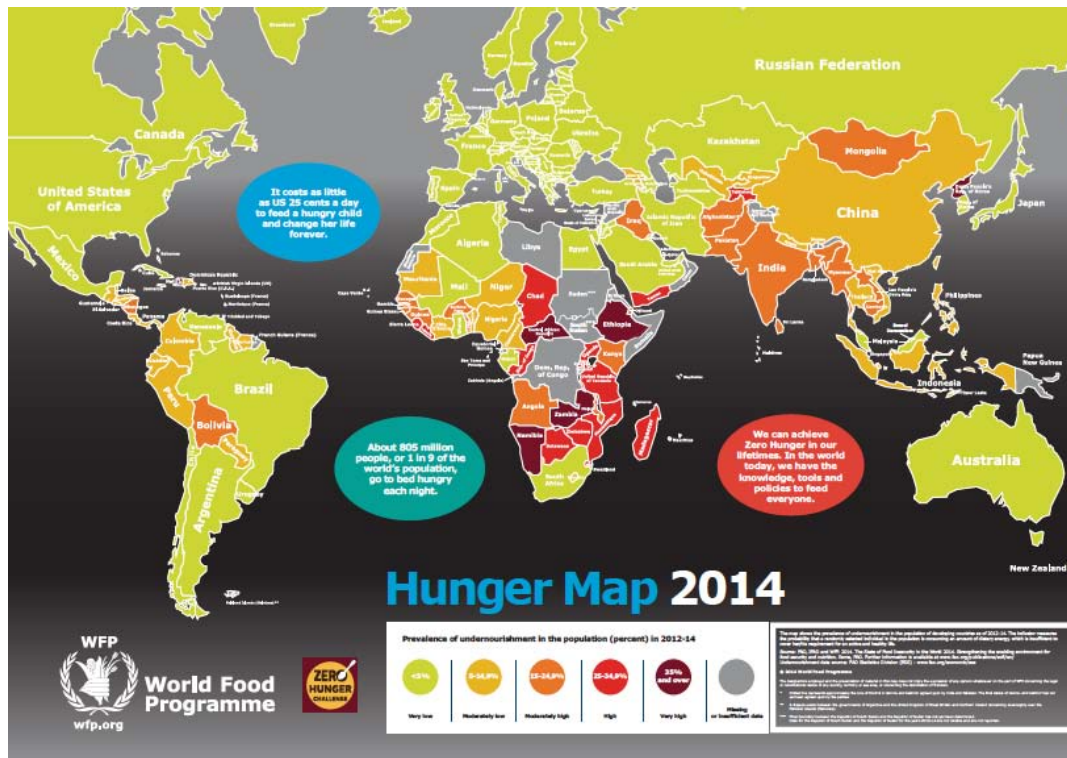
Hunger kills more people every year
than **AIDS, malaria & tuberculosis** combined.



Hunger kills more people every year
than **AIDS, malaria & tuberculosis** combined.



Some 805 million people in the world do not have enough food to lead a healthy active life. That's about one in nine people on earth.



Per capita food supply in Japan & USA in 2011

(FAO Food Balance Sheets, 2016)

	JAPAN	USA
Calories (kcal/day)	2,719	3,639 +++
Animal protein (g/day)	49.1	70.7 +++
Animal fats (g/day)	33.9	68.3 +++
Terrestrial meat (kg/year)	48.8	117.6 +++
Fish & seafood (kg/year)	53.7 +++	21.6
Aquatic animal fat (g/day)	6.14 +++	1.42
Aquatic plants (kg/year)	0.99 +++	0

it is not by chance that Japan, the country with the highest reported life expectancy and with one of the world's lowest incidences of obesity & deaths from heart related illnesses, is also one of the worlds top consumer of aquatic animal products & farmed aquatic plants: comparison made with the USA



Per capita food supply in Japan, USA & Brazil in 2011

(FAO Food Balance Sheets, 2016)

	JAPAN	USA	BRAZIL	WORLD
Calories (kcal/day)	2,719	3,639 +++	3,286 ++	2,870
Animal protein (g/day)	49.1	70.7 +++	51.0	31.8
Animal fats (g/day)	33.9	68.3 +++	56.3 ++	37.0
Terrestrial meat (kg/year)	48.8	117.6 +++	93.0 ++	42.4
Fish & seafood (kg/year)	53.7 +++	21.6	10.6	18.9
Aquatic animal fat (g/day)	6.14 +++	1.42	0.5	1.2
Aquatic plants (kg/year)	0.99 +++	0	0	1.9
Fish/seafood (g protein/d)	18.6	5.2	2.7	5.2
Fish/Animal protein (%)	38.0	7.4	5.4	16.4



- Aquatic food products represent one of the world's most nutritious & healthy foods
- According to FAO/WHO Joint Expert Consultation on the Risks & Benefits of Fish Consumption, there is convincing evidence that
 - Fish consumption reduces the risk of death from coronary heart disease & consumption by women reduces the risk of suboptimal neurodevelopment in their offspring;
 - There is also emerging, possible or probable evidence, that fish consumption may also reduce the risk of ischaemic stroke, non-fatal coronary heart disease events, congestive heart failure, atrial fibrillation, cognitive decline, depression, anxiety & inflammatory diseases



NUTRITIONAL COMPOSITION OF AQUATIC FOODS

Compared with terrestrial farmed meat products, aquatic animal & plant foods (whether captured or cultured) are:

- Rich source of high quality animal **protein** with a mean of **17.3%** compared with **13.8%** for terrestrial meat;
- Rich source of long chain **omega-3 fatty acids - DHA**;
- Rich source of essential minerals, including **Calcium**, **Phosphorus**, **Sodium**, **Magnesium**, **Iron**, **Zinc**, **Manganese**, **Copper**, **Iodine**, **Chromium**, **Fluorine**;
- Rich source of essential vitamins, including **Vitamin A**, **Vitamin D**, **Vitamin B₁₂**, **Folic acid**, **Vitamin E**, **Choline**



Composition of different purchased foods (FAO, 2001)

Protein



Fat



kcal/100g

Aquatic plants
Cephlapods frozen
Molluscs frozen
Crustaceans frozen
Marine fish nes fillet
Pelagic fish fillet
Demersal fish fillet
Freshwater/diadromous fish fillet

Mainly polyunsaturated
omega-3 fatty acids

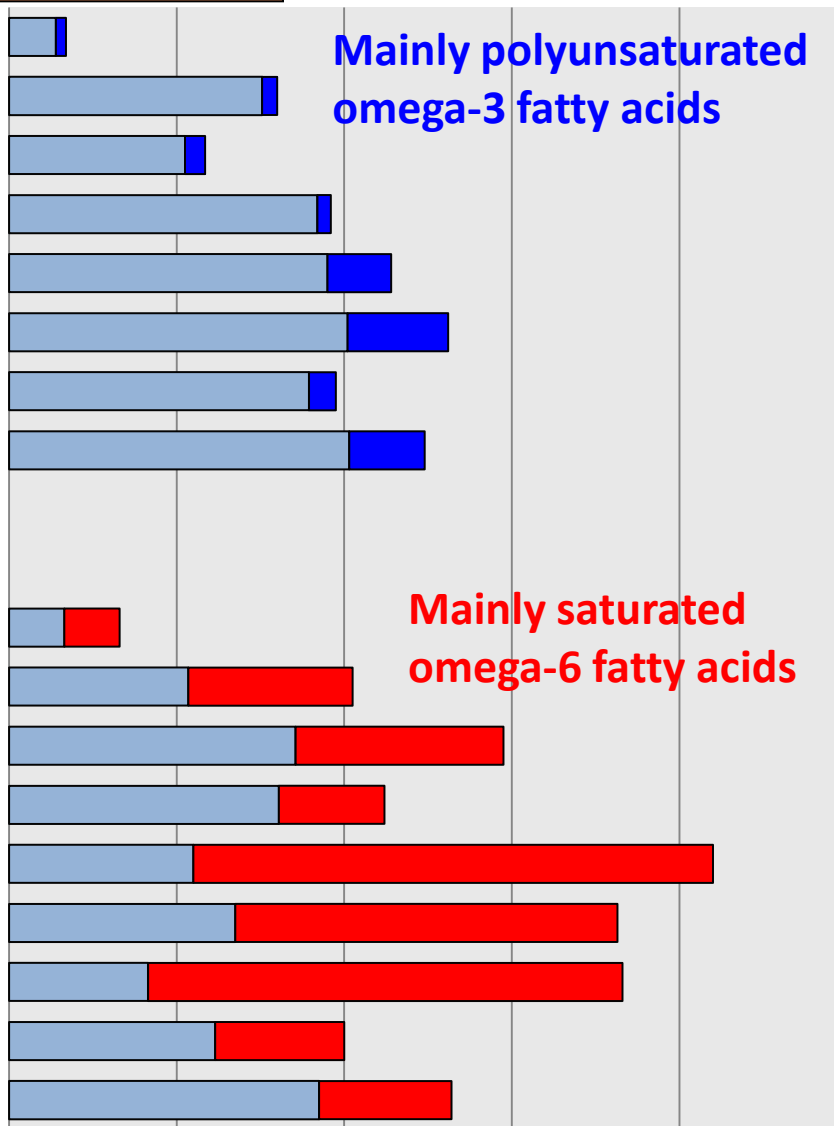
54.0
74.0
71.0
91.0
115.0
141.0
90.0
127.0

Cows milk
Hens egg
Poultry meat
Turkey meat
Pig meat
Muttton & lamb
Duck meat
Chicken meat
Beef boneless

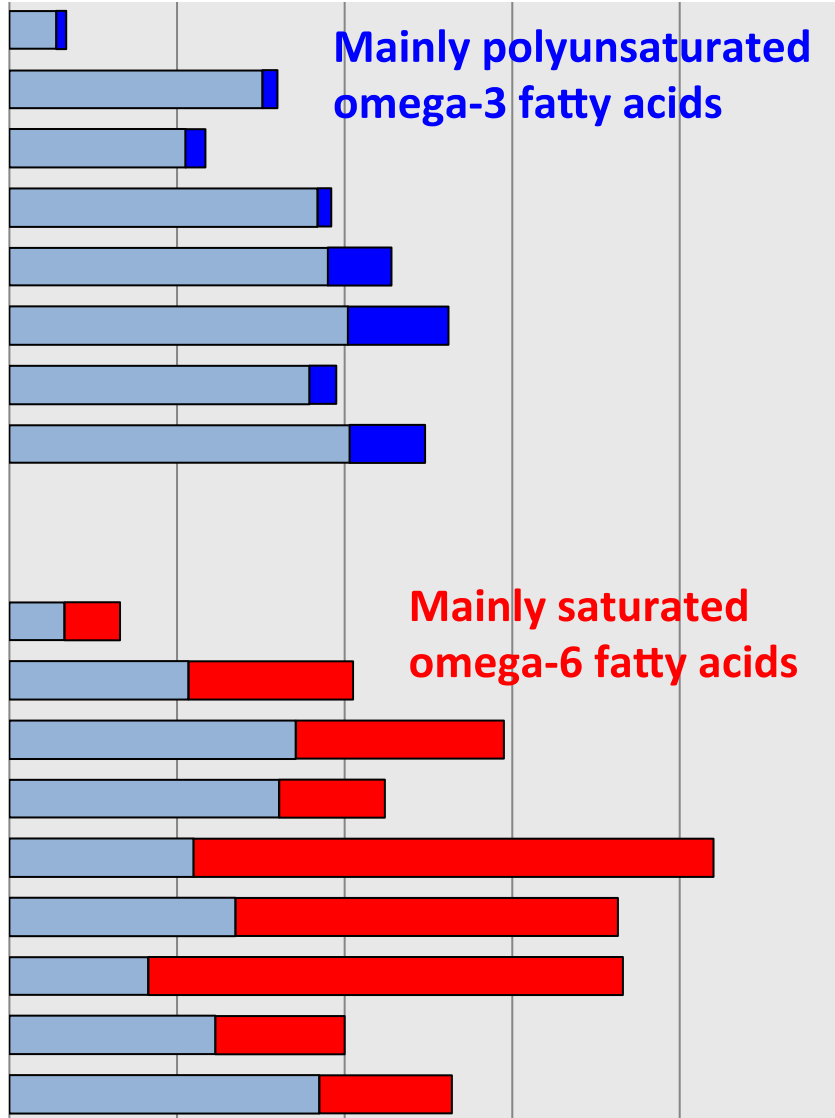
Mainly saturated
omega-6 fatty acids

61.0
139.0
185.0
126.0
326.0
263.0
291.0
122.0
150.0

0 10 20 30 40 50 g/100g

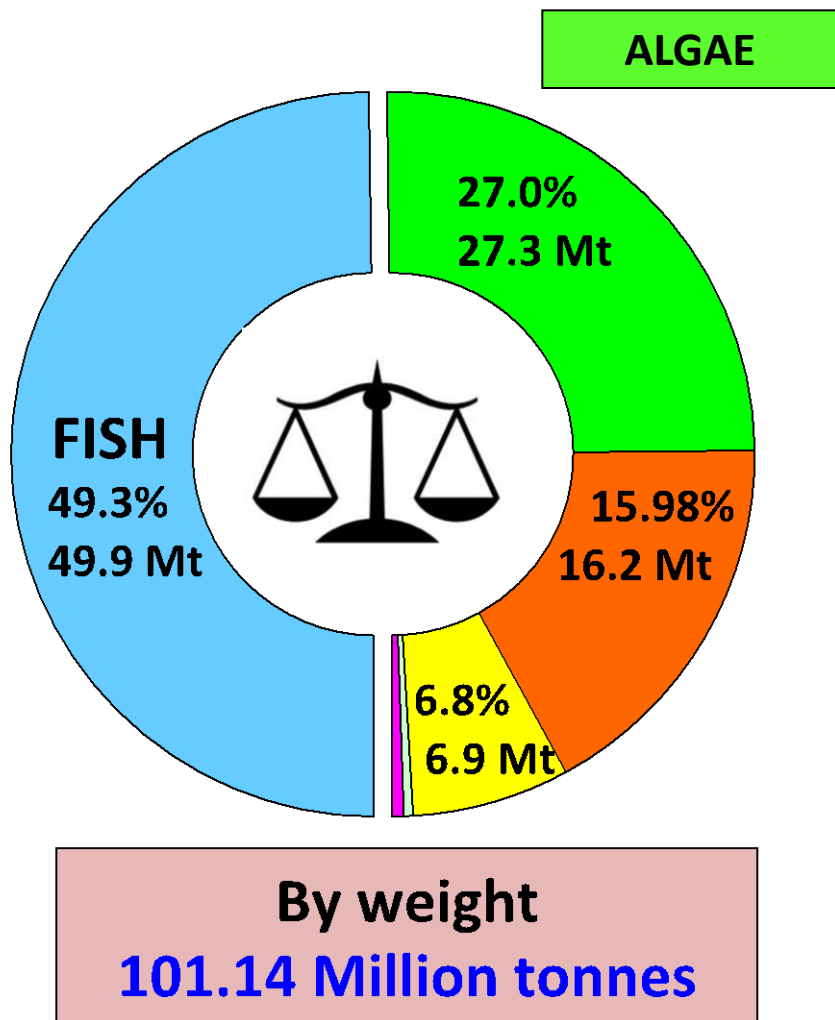


THE FOOD DILEMMA



Aquaculture production by major species group in 2014

(values given in million metric tonnes & US \$ billion; FAO, 2016)



Red seaweeds	16,550,836
Brown seaweeds	10,207,765
Green seaweeds	14,033
Misc aquatic plants	534,329
<i>Spirulina nei</i>	85,705
- China	85,350
- Greece	126
- CAR	40 F
- Mexico	5.76
- Senegal	3
<i>Spirulina platensis</i>	100 (Bukina faso)
<i>Haematococcus pluvialis</i>	226 F
- China	200
- Chile	26

TOTAL 27,306,965 tonnes US 5.6 billion

China 48.8%, Indonesia 36.9%, Philippines 5.7%, Korea R 4.0%, Korea DPR 1.6%, Japan 1.3%

CULTIVATION

Orderly plots of seaweed checker the shallow ocean bottom off islands east of Bali. The crop can go for 25 cents (U.S.) a pound—significantly more than rice. Seaweed derivatives thicken familiar products from whipping cream to wrinkle cream.

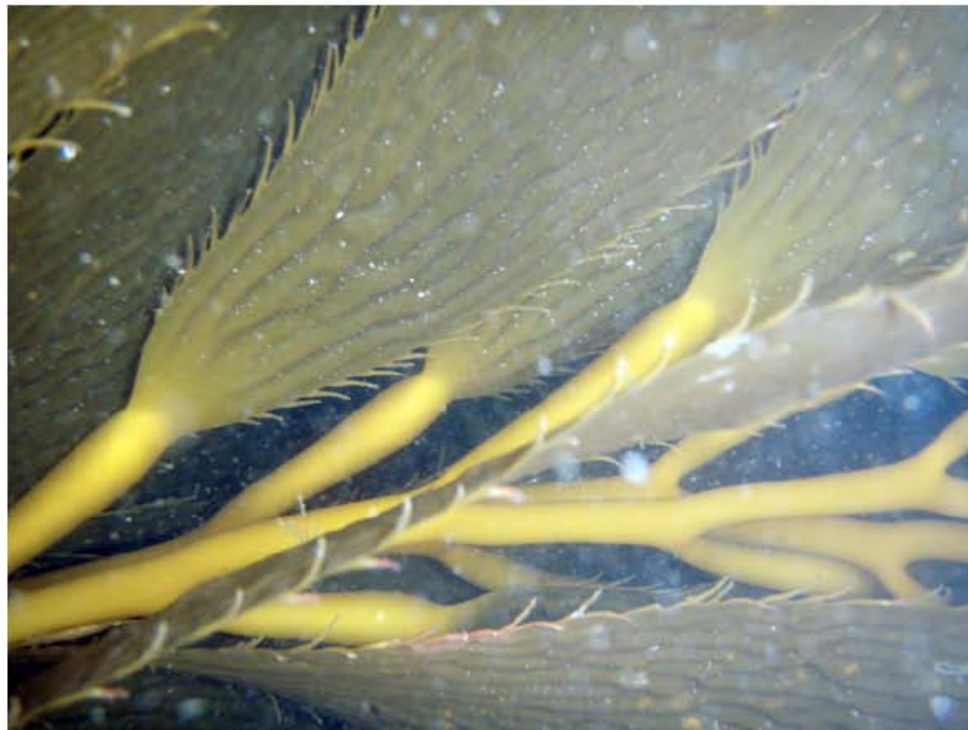




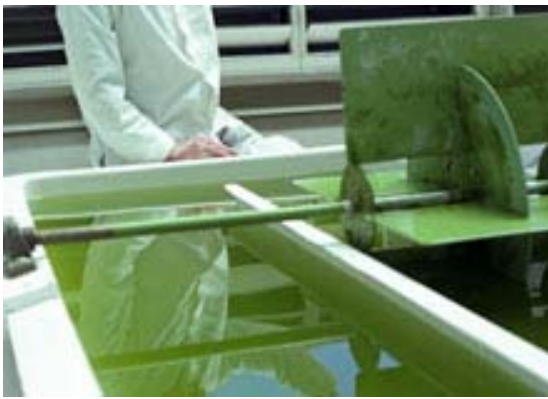
March 31, 2008

Techno-Economic Feasibility Analysis of Offshore Seaweed Farming for Bioenergy and Biobased Products

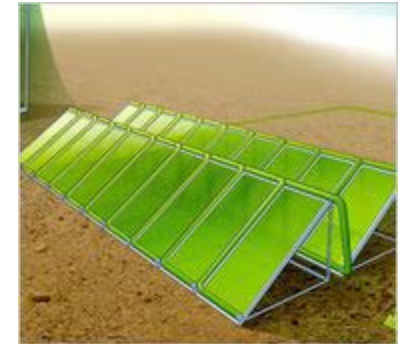
Independent Research and Development Report
IR Number: PNWD-3931
Battelle Pacific Northwest Division



California kelp macroalgae seaweed underwater (Copyright: Jane Thomas, IAN, UMCES)
© - Heliae Development, LLC. 2012



Single Cell Oils



Martek's Life DHA 40-50% DHA
 Martek's DHA-S 32-38% DHA
 LonzaDHA *Ulkenia* 32% min DHA
 Dupont's NewHarvest Yeast *yarrowia lipolytica* 50% EPA
 Also Syngenta, Dow Agrisciences
 Numerous crossover bioenergy companies BioCentric,
 Aurora, Solazyme

Heterotrophic Algae Production

- Closed, controlled system
- Traceable
- Pure
- Higher level of consistency
- Protected by AQS

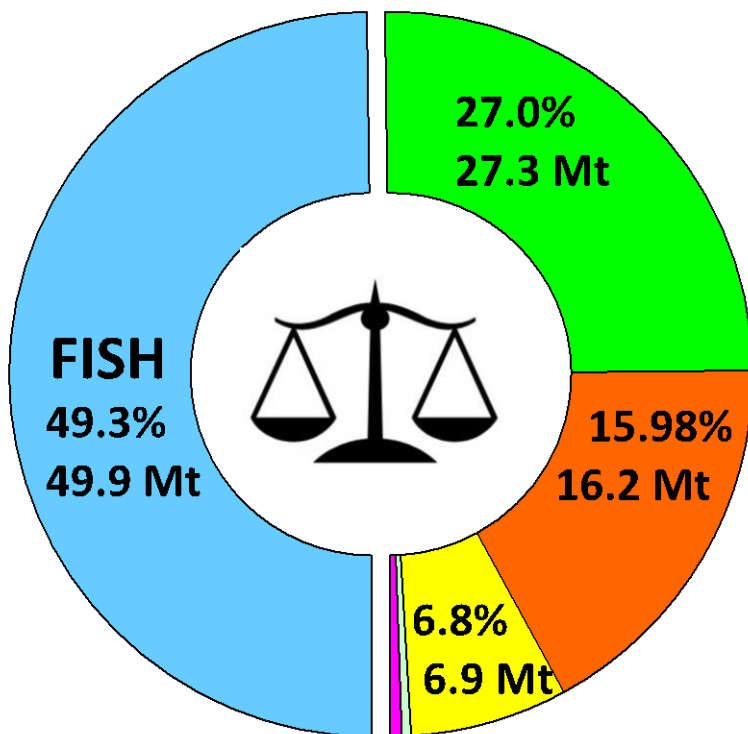
ALL-G-RICH

Natural, pure,
sustainable source of
high quality DHA.



Aquaculture production by major species group in 2014

(values given in million metric tonnes & US \$ billion; FAO, 2016)



By weight
101.14 Million tonnes

MOLLUSCS

Clams, cockles, arkshells	5,360,280
Oysters	5,155,257
Scallops, pectens	1,922,345
Mussels	1,901,962
Misc marine molluscs	1,134,531
Abalones, winkles, conchs	471,466
Freshwater molluscs	167,351
Pearls, mother of pearls, shells	48,382
Squids, cuttlefishes, octopuses	1.2

T - 16,161,576 tonnes US 19.2 billion

China 83.0%, Japan 2.3%, KoreaR 2.2%, Chile 1.5%, Spain 1.4%, Thai 1.3%, VN 1.2%, USA 1.0%











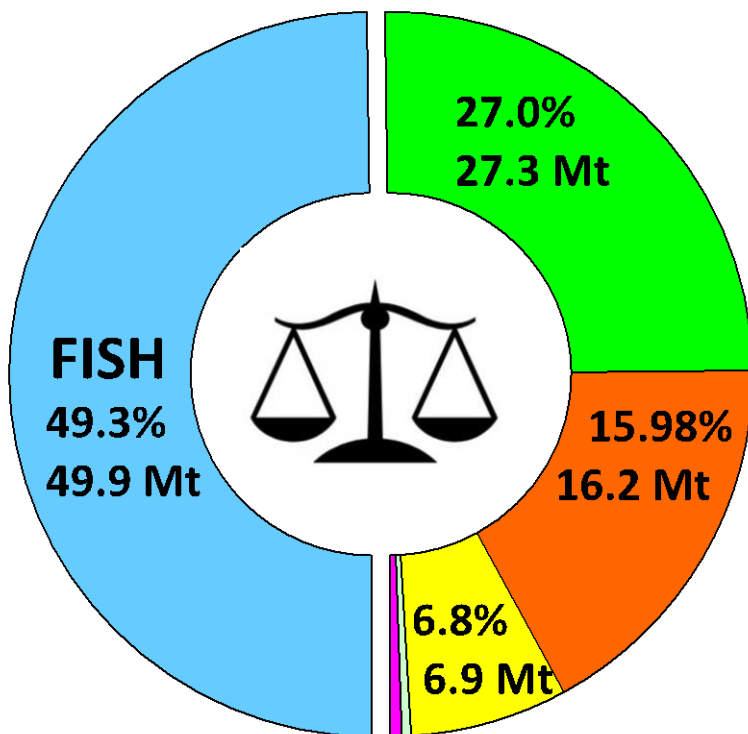


**FAVOR
DE NO METER
LAS MANOS EN
LOS TANQUES
DE CULTIVO**



Aquaculture production by major species group in 2014

(values given in million metric tonnes & US \$ billion; FAO, 2016)



By weight

101.14 Million tonnes

CRUSTACEANS

Shrimps	4,580,769
Freshwater crustaceans	2,016,505
Crabs, sea spiders	316,850
Lobsters	948

Whiteleg shrimp	3,668,681
Chinese mitten crab	796,621
Red swamp crawfish	723,288
Giant tiger prawn	634,522
Oriental river prawn	257,641
Giant river prawn	216,857
Indo-Pacific swamp crab	183,852

Total 6,915,072 tonnes US 36.2 billion

China 57.7%, Indonesia 8.9%, VN 7.3%, India 5.6%, Ecuador 4.9%, Thailand 4.3%, Bangla 1.9%

A photograph of a newly constructed earthen pond in a rural area of Thailand. The pond is filled with water and has a dirt bank on the right side. A person in a red shirt and dark shorts is standing on the bank. The background shows a line of trees and a small building. A blue text box with yellow text is overlaid on the image.

Small-scale newly constructed earthen ponds - Thailand



Extensive earthen ponds - Panama



Semi-intensive earthen ponds - Mexico



Intensively managed lined ponds - Indonesia





Ubicación de las fincas del grupo Modercorp

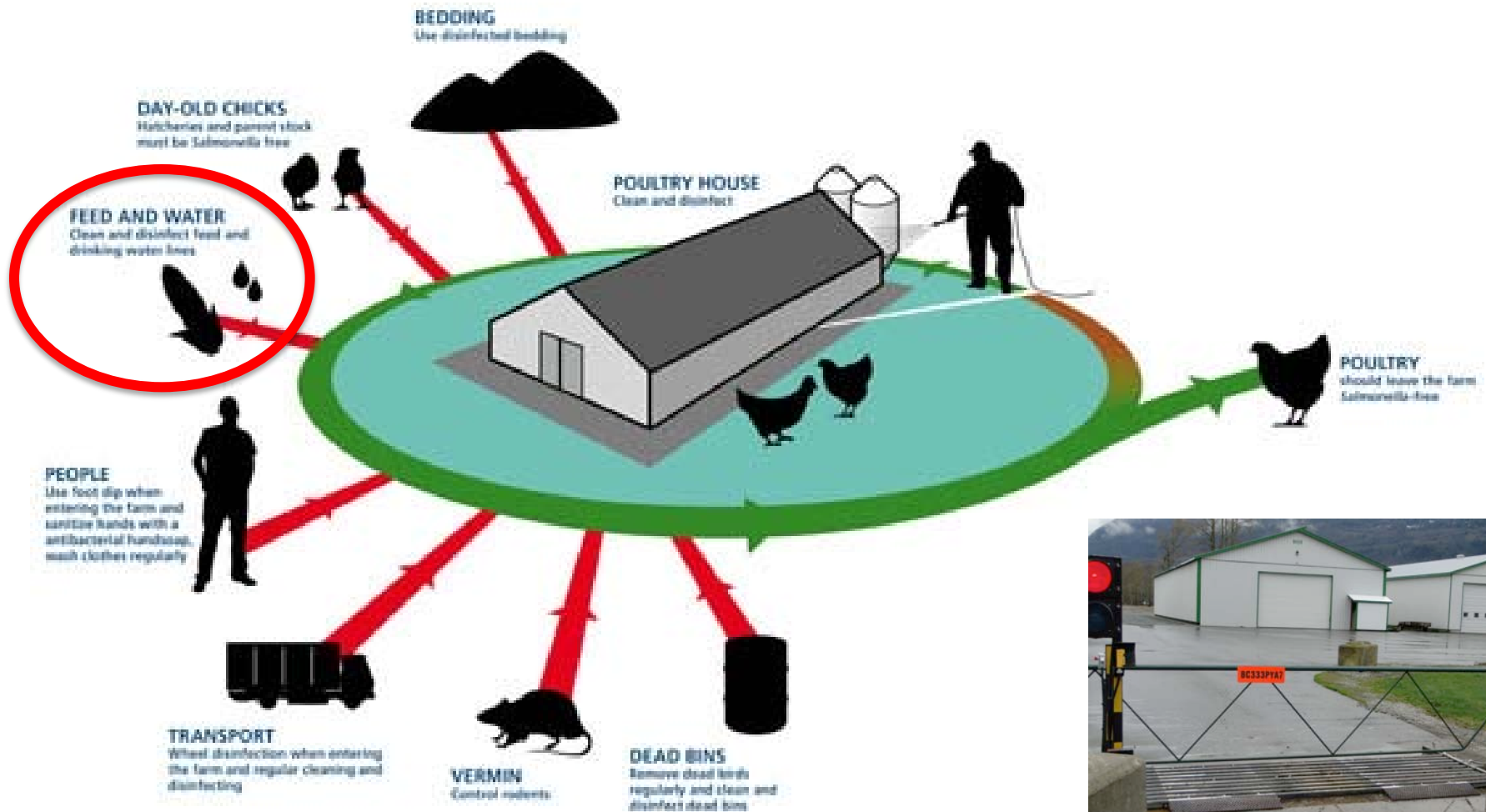


Zero-water exchange flocc-based culture systems



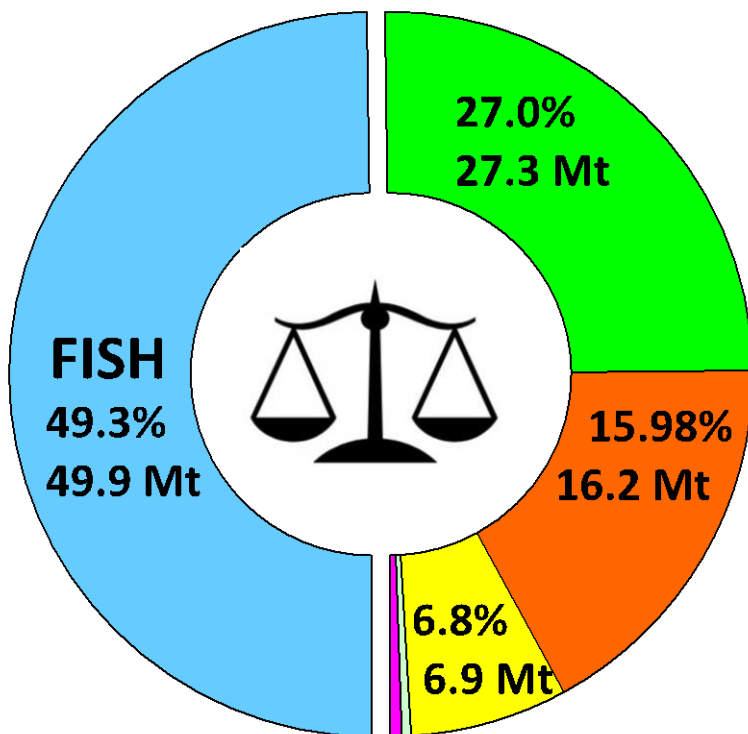
Biosecure Shrimp Feeds & Feeding Practices

means that “Feed, whether live, fresh or formulated, and the management of the feed on the farm, should not be an entry point of potential pathogens to the shrimp and/or culture system”



Aquaculture production by major species group in 2014

(values given in million metric tonnes & US \$ billion; FAO, 2016)



By weight
101.14 Million tonnes

FISHES

Freshwater fishes	42,617,080
Diadromous fishes	4,866,482
Marine fishes	2,378,328
Carps & cyprinids	28,225,908
Misc FW fishes	9,083,152
Tilapia & other chiclids	5,308,019
Salmons & trouts	3,416,925
Misc coastal fishes	1,117,611
Misc diadromous fishes	1,111,155
Marine fishes, not ident	692,128

T – 49,861,891 tonnes US 101.3 billion

China 54.6%, India 9.0%, Indonesia 7.3%, VN 5.4%, Bangladesh 3.4%, Norway 2.7%, Egypt 2.3%

Top 20 cultured fish & crustacean species in 2014

(million tonnes - Mt; FAO/FISHSTAT, 2016)

Top 10 fed species

01. Grass carp	5.54 Mt
02. Silver carp	4.97
03. Common carp	4.16
04. Nile tilapia	3.67
05. Whiteleg shrimp	3.67
06. Bighead carp	3.25
07. Catla	2.77
08. Carassius sp	2.77
09. Atlantic salmon	2.33
10. Freshwater fish nei	2.28
Sum of top 10	35.41 Mt

Top 11-20 fed species

11. Roho labeo	1.67 Mt
12. Pangasius catfish	1.62
13. Tilapia nei	1.16
14. Milkfish	1.04
15. Rainbow trout	812,940 t
16. Torpedo-shaped catfish	809,181
17. Chinese mitten crab	796,622
18. Wuchang bream	783,023
19. Red swamp crawfish	723,288
20. Cyprinids nei	722,627
Sum of 2nd 10	10.13 Mt

TOP FED FISH & CRUSTACEAN SPECIES GROUPS - 2014

Top fed species		Tonnes	APR 2000-14	US \$ billion
1	Chinese carp	13,805,309	4.78 %	18.59
2	Tilapia	5,307,948	11.27 %	8.82
3	Shrimp	4,580,769	10.47 %	23.58
4	Catfishes	4,495,857	16.51 %	7.88
5	Salmon	2,526,433	6.65 %	15.83
6	Misc FW & D fish	2,408,608	16.47 %	6.99
7	Marine fish	2,378,328	6.56 %	9.71
8	FW crustaceans	2,016,505	11.69 %	11.55
9	Milkfish	1,039,184	5.86 %	1.71
10	Trout	838,262	3.64%	4.09
11	Eel	249,515	1.15 %	1.44
Top fed species		39,646,718	7.75 %	110.19

Calculated from FISHSTAT – FAO (2016)

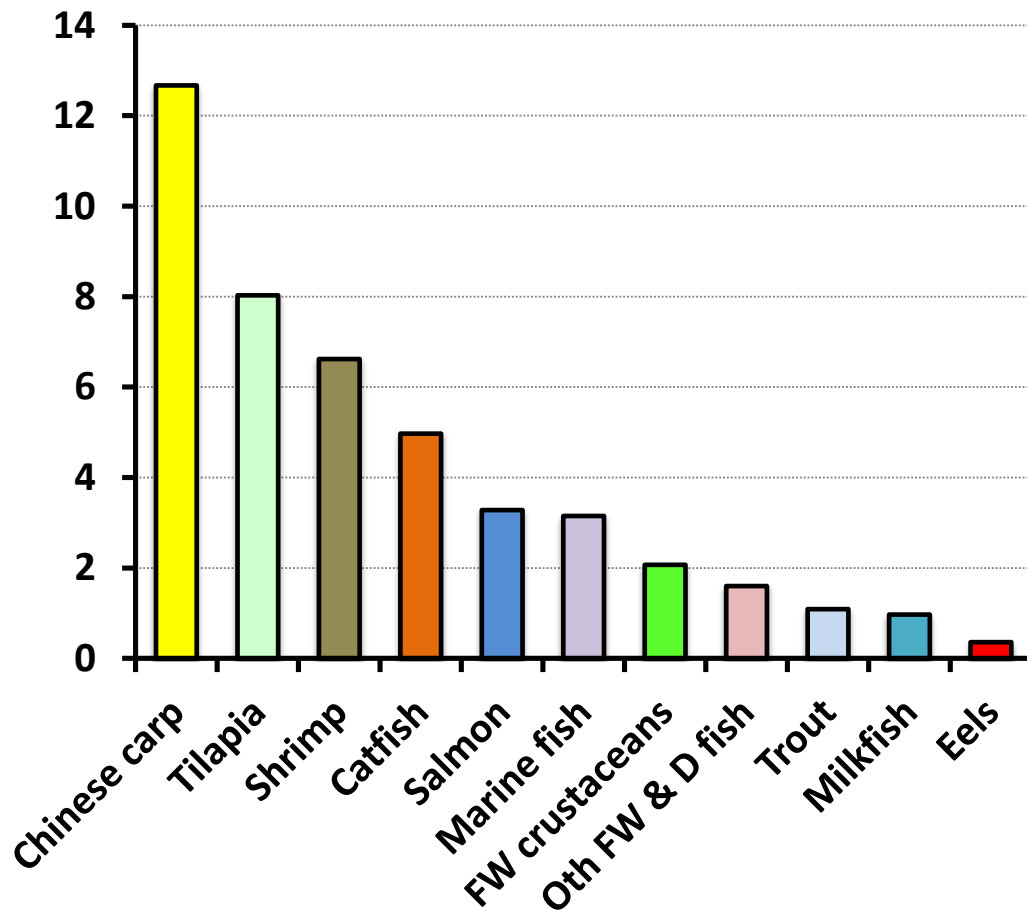
Global commercially compounded aquafeed production



TOTAL COMMERCIAL AQUAFEED PRODUCTION

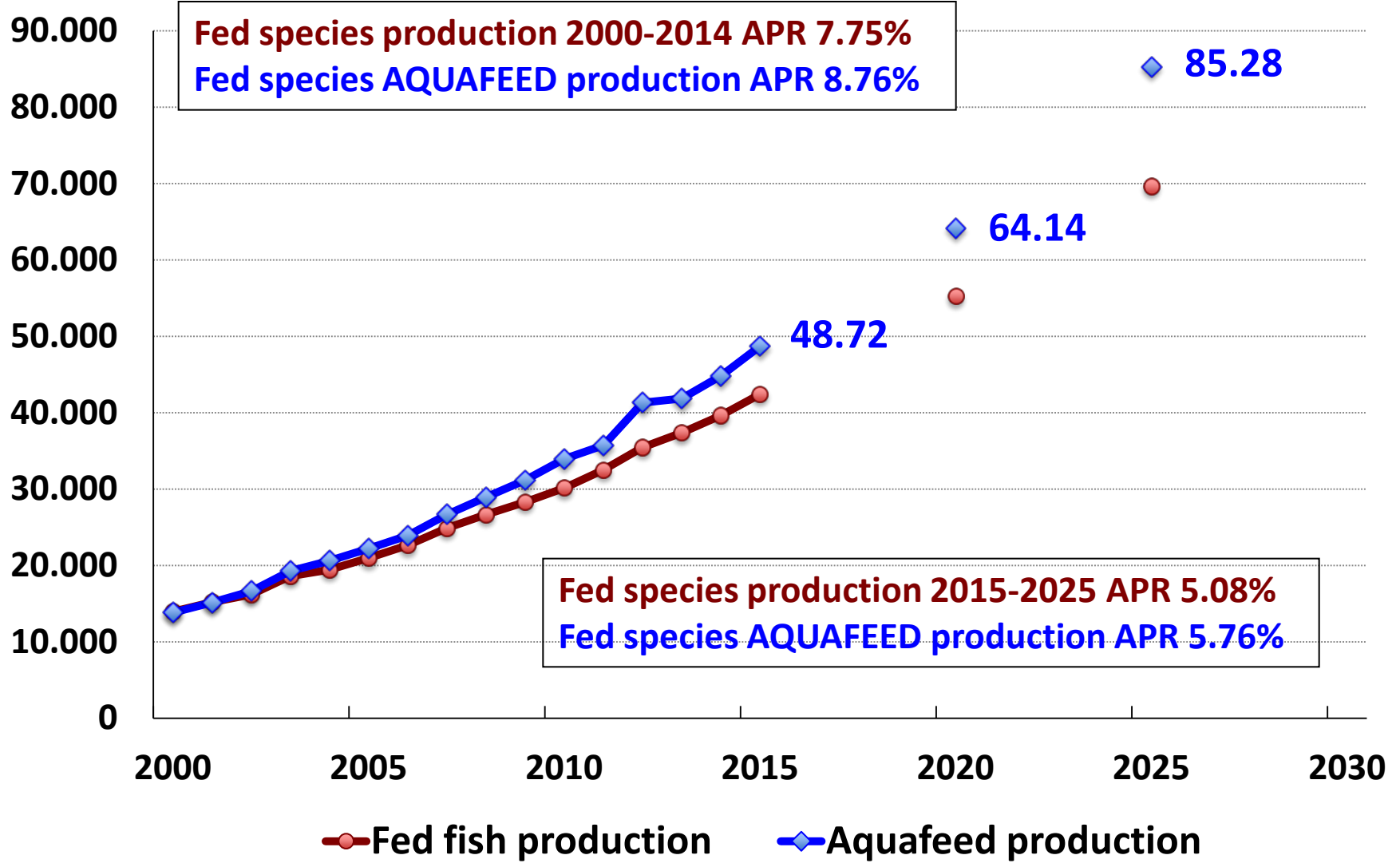
Estimated at **44.82 million tonnes (Mt)** in **2014**, and expected to rise to **48.72 Mt** by **2015**, **64.14 Mt** by **2020**, and **85.28 Mt** by **2025**

2014 estimated feed production



Chinese carp	12.67 Mt
Tilapia	8.03 Mt
Shrimp	6.62 Mt
Catfish	4.97 Mt
Salmon	3.28 Mt
Marine fish	3.15 Mt
FW crustaceans	2.07 Mt
Other FW & D fish	1.60 Mt
Trout	1.09 Mt
Milkfish	0.97 Mt
Eels	0.36 Mt
Total	44.82 Mt

Estimated fed species & aquafeed production (million tonnes)

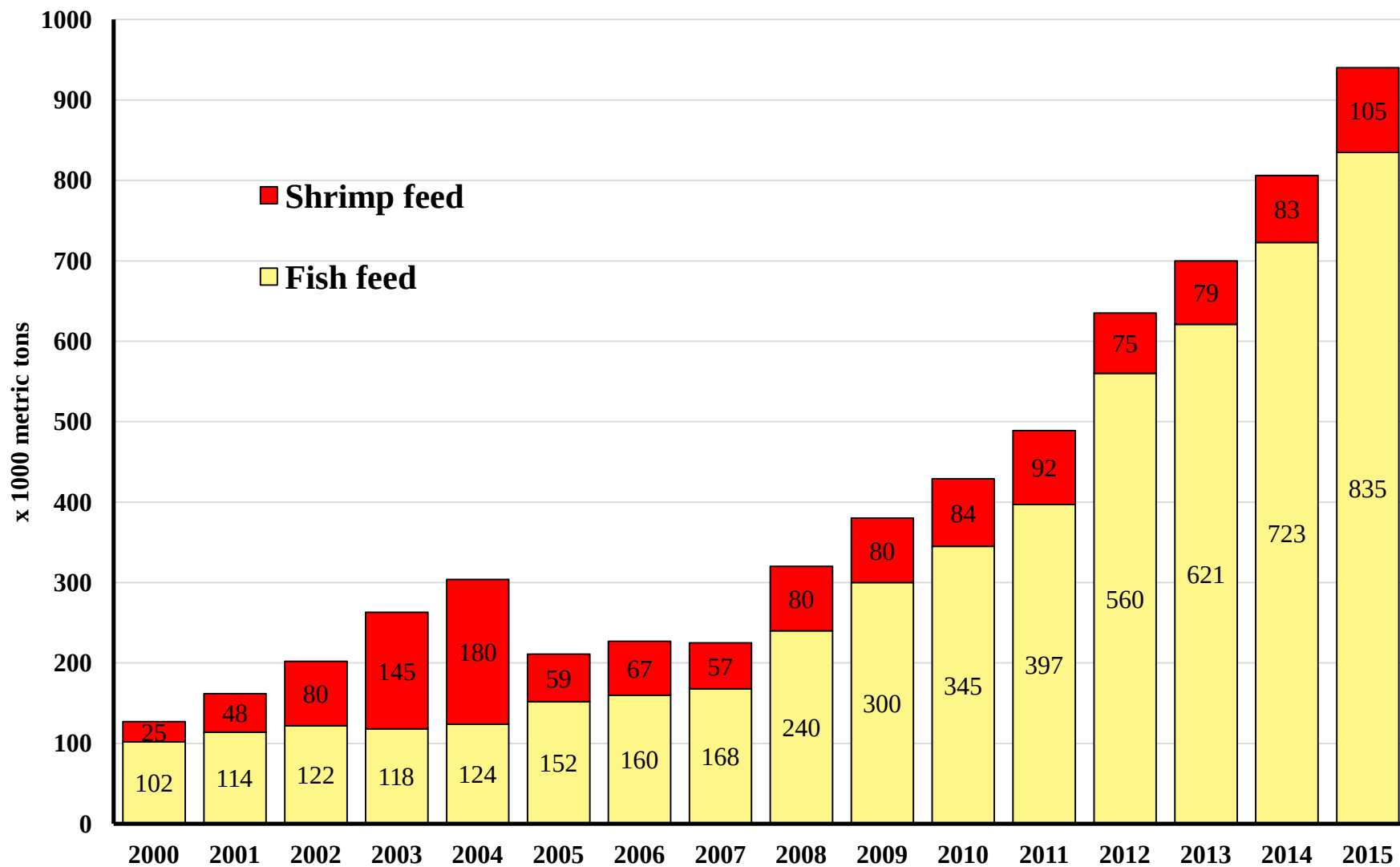


TOTAL FEED BY SPECIES (METRIC TONS)

Poultry	439 M	Pig	256 M	Ruminant	196 M
Pet	22 M	Aqua	41 M	Equine	11 M

Country	Total Mil Tons	Pig	Dairy	Beef	Calf	Layer	Broiler	Turkey	Aqua	Pets	Horse
China	183	85	6	2	0.2	24	41	0	18	0.4	0
USA	173	24	19	21	0	20	55	7	11	9	6
Brazil	66	14	5	3	0	6	31	1	1	2	1
Mexico	31	5	5	3	0.2	4	11	0.3	0.2	1	0.5
Spain	29	14	3	4	0.2	2	3	0.4	0.2	0.5	0.2
India	29	0	8	0.1	0.1	9	11	0	1	0	0
Russia	26	9	2	0.3	0	4	10	0.6	0	0.5	0
Japan	24	6	3	5	0	6	4	0	0	0.3	0
Germany	24	10	7	0	0.3	2	4	0	0	0	0.3
France	22	5.3	3	2	0.4	2	3	1	0	1.1	0.3

Aquafeed production in Brazil (metric tons)*



Source: Sindiracoos

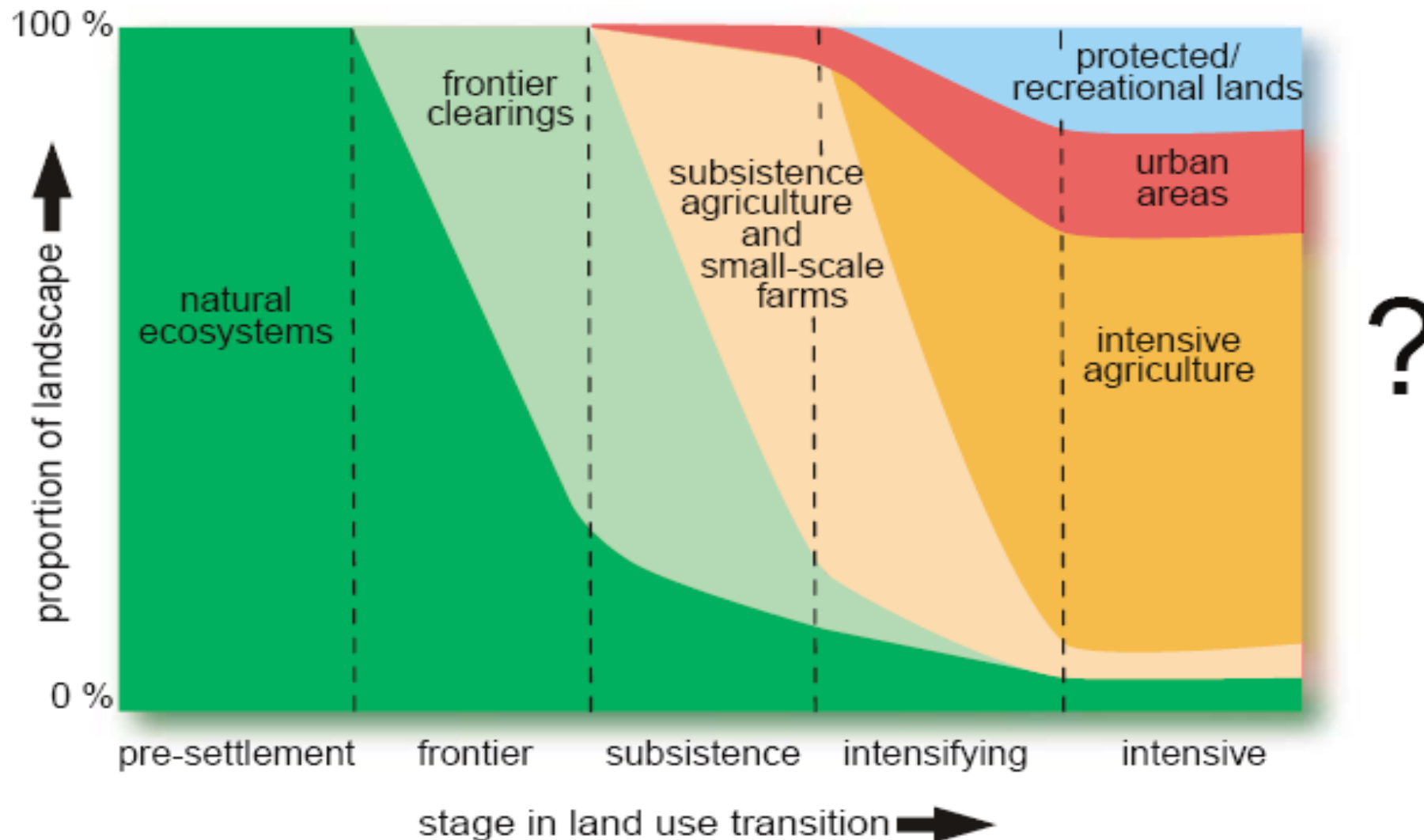
TILAPIA



Global Consequences of Land Use

Jonathan A. Foley,^{1*} Ruth DeFries,² Gregory P. Asner,³ Carol Barford,¹ Gordon Bonan,⁴ Stephen R. Carpenter,⁵ F. Stuart Chapin,⁶ Michael T. Coe,^{1†} Gretchen C. Daily,⁷ Holly K. Gibbs,¹ Joseph H. Helkowski,¹ Tracey Holloway,¹ Erica A. Howard,¹ Christopher J. Kucharik,¹ Chad Monfreda,¹ Jonathan A. Patz,¹ I. Colin Prentice,⁸ Navin Ramankutty,¹ Peter K. Snyder⁹

www.sciencemag.org SCIENCE VOL 309 22 JULY 2005







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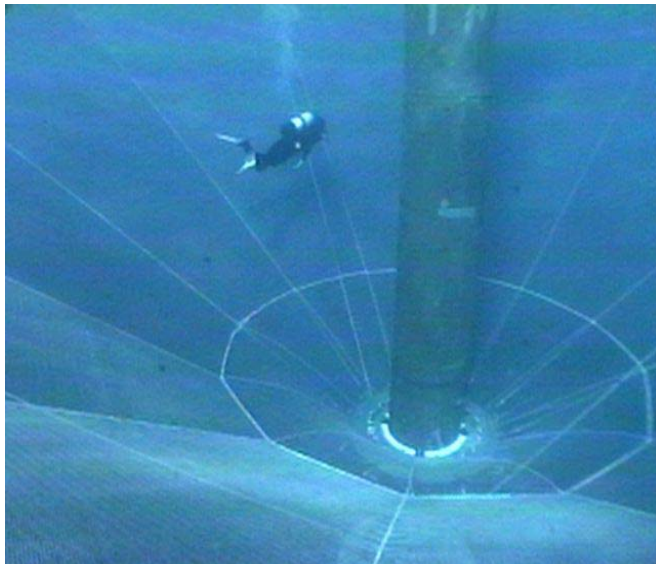


Cage culture systems employed by farmers are as diverse as the number of species raised, varying from traditional family-owned/operated cage farming operations (typical of most Asian countries) to large-scale commercial farming operations (typical of most Northern Europe & the Americas).



*Despite the above constraints, **cage aquaculture** is currently one of the fastest growing segments of global aquaculture production, and holds particular promise for increased production within the marine off-shore ocean environment. Its development would need to be supported by appropriate policy and planning, legal and management frameworks.*

*However, although **oceans cover 71%** of the Earth's surface and provide **99%** of Earth's living space, they represent one of the **least understood ecosystems**; more than **97%** of all our planet's water being contained in the ocean and less than **10%** of this living space having been explored by humans.*



Aquaculture Challenges

Environmental and Social Issues

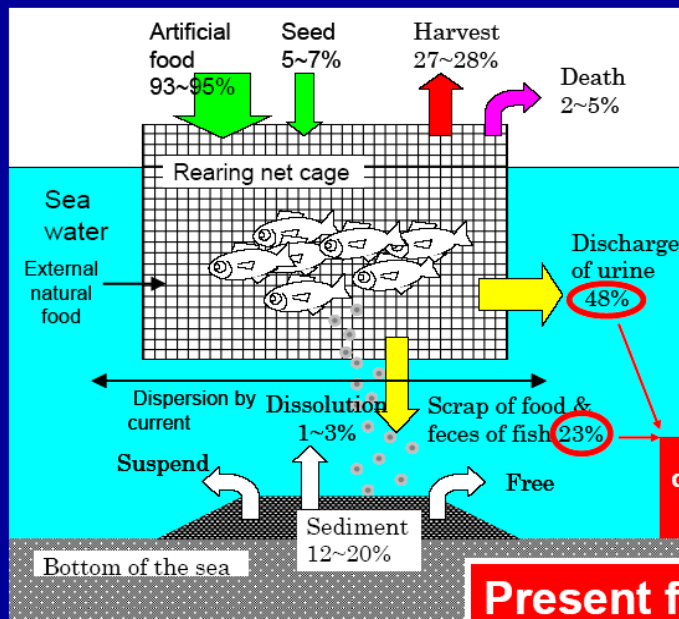


Increased nutrient loss to the surrounding aquatic environment (resulting from uneaten feed, faecal wastes and excreta) and potential negative impacts upon water quality and ecosystem health;

Japan: Yoshihisa Yamamoto, 2006

Problem of self-pollution by mariculture in net cage at coastal waters

Nitrogen balance of mariculture



Trial calculation of the level of coastal pollution by exchange human populations

Estimation value of pollution

TN: 5.4~7.5 million people
TP: 9.6~10.0 million people

**Total discharge (N)
= 71%**

Present form of mariculture impact on coastal environment by huge pollution





Image © 2008 DigitalGlobe

©2007 Google

"Qing Shan" Island in Ningde City, Fujian Province.



Chinese fed carps

Grass carp, Common carp, *Carassius* sp, Wuchang bream, Black carp;

Aquaculture production in 2014: 13.80 million tonnes

Growth: APR of 4.78 % per year from 2000 to 2014

Major producers in 2014: China 91.7%, Indonesia 3.1%, Bangladesh 0.9%, Vietnam, Russian Fed., Iran

Percent total production on feeds in 2014: 54%

Calculated Economic FCR: 1.7

Total aquafeeds in 2014: 12.67 million tonnes (28.3%)



Tilapia

Nile tilapia, Tilapia nei, Blue-Nile tilapia, Mozambique tilapia, Blue tilapia, Three spotted tilapia, Longfin tilapia, Redbreast tilapia, Sabaki tilapia, Redbelly tilapia

Aquaculture production in 2014: 4.82 million tonnes

Growth: APR of 11. 27% per year from 2000 to 2014

Major producers in 2014: China 32.0%, Indonesia 19.6%, Egypt 14.3%, Bangladesh 5.3%, Philippines 4.9%, Vietnam 4.6%, Brazil 3.7%, Thailand 3.6%, Taiwan, Colombia, Mexico, Uganda

Percent total production on feeds in 2014: 89%

Calculated Economic FCR: 1.7

Total aquafeeds in 2014: 8.03 million tonnes (17.9%)



Catfishes

Order Siluriformes – Pangas catfishes, Torpedo-shaped catfishes, Amur catfish, Channel catfish, Yellow catfish, North African catfish, Striped catfish, Hybrid catfish, Sorubims, Philippine catfish, Upsidedown catfishes, Asian redtail catfish, Stinging catfish, South American catfish, Wels catfish;

Aquaculture production in 2014: 4.50 million tonnes

Growth: APR of 16.51 % per year from 2000 to 2014

Major producers in 2014: Vietnam 25.7%, Indonesia 24.4%, China 23.5%, Bangladesh 8.3%, Nigeria 4.5%, USA 3.1% & Thailand 3.1%

Percent total production on feeds in 2014: 79%

Calculated Economic FCR: 1.4

Total aquafeeds in 2014: 4.97 million tonnes (11.1%)



Other freshwater & diadromous fishes

Includes families: Channidae, Synbranchidae, Percichthyidae, Characidae, Centrarchidae, Centropomidae, Osphronemidae, Belontiidae, Osmeridae – Snakehead, Asian swamp eel, Mandarin fish, Largemouth black bass, Piarapatinga, Cachama, Japanese seabass, Giant gourami, Barramundi, Tambacu hybrid, Snakeskin gourami, Pacu, Indonesian snakehead, Tambatinga hybrid, Pond smelt, Striped snakehead, Nile perch; ;

Aquaculture production in 2014: 2.41 million tonnes

Growth: APR of 16.47 % per year from 2000 to 2014

Major producers in 2014: China 72.4%, Indonesia 9.1%, Brazil 8.7%, Thailand 2.1%, Myanmar 1.3%

Percent total production on feeds in 2014: 37%

Calculated Economic FCR: 1.8

Total aquafeeds in 2014: 1.60 million tonnes (3.6%)



Salmon

Atlantic salmon, Coho salmon, Chinook salmon,
Salmonids & Salmonoids nei;

Aquaculture production in 2014: 2.53 million tonnes

Growth: APR of 6.65 % per year from 2000 to 2014

Major producers in 2014: Norway 49.8%, Chile 31.8%,
UK 6.5% (F), Faroe Islands 3.4%, Canada 3.4%, Australia
1.6%, USA, Russian Federation

Percent total production on feeds in 2014: 100%

Calculated Economic FCR: 1.3

Total aquafeeds in 2014: 3.28 million tonnes (7.3%)



Trout

Rainbow trout, Trouts nei, Sea trout, Brook trout, Sevan trout;

Aquaculture production in 2014: 838,262 tonnes

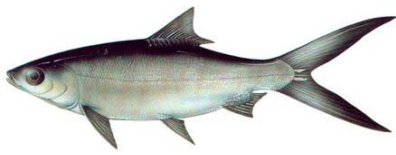
Growth: APR of 3.64 % per year from 2000 to 2014

Major producers in 2014: Chile 18.1%, Iran 15.1%, Turkey 13.5%, Norway 8.2%, Italy 4.3% (F), Denmark 4.3% F, France 4.2% (F), Peru 3.9%, China 3.4%, Russian Federation, USA

Percent total production on feeds in 2014: 100%

Calculated Economic FCR: 1.3

Total aquafeeds in 2014: 1.09 million tonnes (2.4%)



Milkfish

Milkfish – Chanos chanos;

Aquaculture production in 2014: 1.04 million tonnes

Growth: APR of 5.86 % per year from 2000 to 2014

Major producers in 2014: Indonesia 55.6%, Philippines 37.5%, Taiwan 6.6%, Singapore 0.2%

Percent total production on feeds in 2014: 49%

Calculated Economic FCR: 1.9

Total aquafeeds in 2014: 967,000 tonnes (2.2%)



Eel

Family Anguillidae – Japanese eel, European eel, Short-finned eel & River eels nei

Aquaculture production in 2014: 249,515 tonnes

Growth: APR of 1.15 % per year from 2000 to 2014

Major producers in 2014: China 87.6%, Japan 7.1%, Korea Rep. 2.3%, Netherlands 0.7%, Taiwan, Indonesia, Denmark

Percent total production on feeds in 2014: 97%

Calculated Economic FCR: 1.5

Total aquafeeds in 2014: 362 thousand tonnes (0.8%)



Marine fish

Includes all ISSCAAP division – Marine fishes nei, Gilthead seabream, Japanese amberjack, European seabass, Flathead grey mullet, Japanese seabass, Pompano, Groupers nei, Large yellow croaker, Turbot, Red drum, Silver seabream, Lefteye flounders nei, Bastard halibut, Cobia, Korean rockfish, Atlantic cod, Tiger pufferfish, Eastern pomfred, Amberjacks nei etc

Aquaculture production in 2014: 2.38 million tonnes

Growth: APR of 6.56 % per year from 2000 to 2014

Major producers in 2014: China 50.2%, Japan 9.5%, Egypt 6.6% F, Turkey 5.1%, Bangladesh 3.9%, India 3.8% F, Greece 3.6%

Percent total production on feeds in 2014: 78%

Calculated Economic FCR: 1.7

Total aquafeeds in 2014: 3.15 million tonnes (7.0%)



Shrimp

Whiteleg shrimp, Giant tiger prawn, Penaeus shrimp nei, Kuruma prawn, Fleshy prawn, Metapenaeus shrimp nei, Indian white prawn, Speckled shrimp, Banana prawn, Blue shrimp, Greasyback shrimp

Aquaculture production in 2014: 4.58 million tonnes

Growth: APR of 10.47 % per year from 2000 to 2014

Major producers in 2014: China 40.7%, Indonesia 13.1%, VN 10.6%, India 8.2%, Ecuador 7.4%, Thai 6.2%, Mexico 1.9%, Bangladesh 1.8%, Brazil 1.4%

Percent total production on feeds in 2014: 85%

Calculated Economic FCR: 1.7

Total aquafeeds in 2014: 6.62 million tonnes (14.8%)



Freshwater crustaceans

Chinese mitten crab, Red swamp crawfish, Oriental river prawn, Giant river prawn, River prawns nei, Danube crayfish, Marron crayfish, Red claw crayfish & Yabby crayfish etc

Aquaculture production in 2014: 2.02 million tonnes

Growth: APR of 11.69 % per year from 2000 to 2014

Major producers in 2014: China 92.1%, USA 3.2%, Bangladesh 2.4%, Thailand 0.9%, India, Taiwan ...

Percent total production on feeds in 2014: 54%

Calculated Economic FCR: 1.9

Total aquafeeds in 2014: 2.07 million tonnes (4.6%)



The importance of applied research in securing the future & long term sustainability of the aquaculture sector

