



WEDNESDAY 22 FEBRUARY 2017

Food Matters: Fish, Income & Food Supply

FIFS - a comparative analysis

Albert G.J. Tacon¹ & Marc Metian²

¹Aquatic Farms Ltd, Kaneohe, HI 96744, USA

*²International Atomic Energy Agency – Environment
Laboratories, Monaco, Principality of Monaco*



Fish Matters: Importance of Aquatic Foods in Human Nutrition & Global Food Supply

Albert G.J. Tacon¹ & Marc

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Feed Matters: Satisfying the Feed demand of Aquaculture

Albert G.J. Tacon¹ & Marc

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2015 Reviews in Fisheries Science & Aquaculture 22:1-10



Food Matters: Fish, Income & Food Supply

FIFS - a comparative analysis



The current presentation has been prepared in support of **AwF** as an **information paper** to show the **importance of fish & fishery products in human nutrition & global food supply**



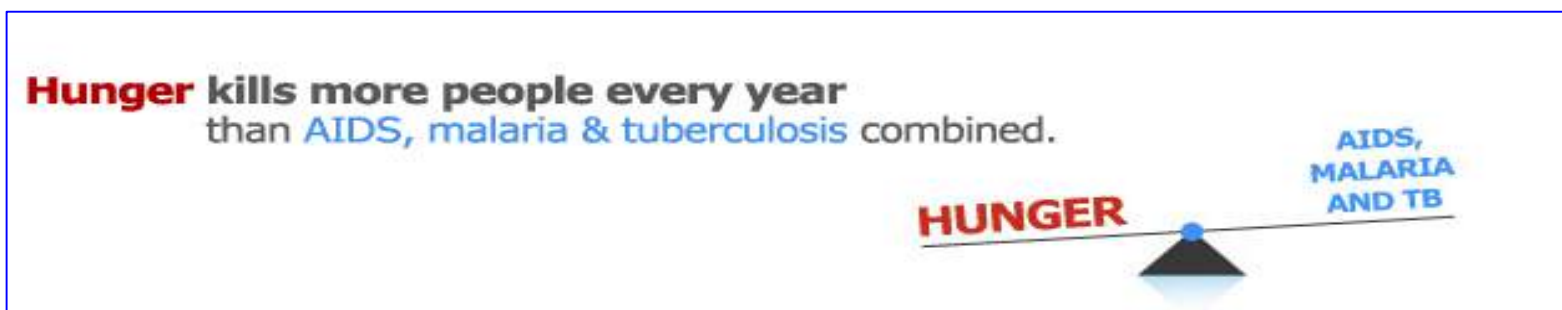
Aquaculture without Frontiers is a registered charity whose mission is to: **Promote & support responsible & sustainable aquaculture to alleviate poverty & malnutrition & to enhance food security for disadvantaged people**

This presentation aims to compare the role played by fish & seafood (capture & farmed) in the diet of the world's poorest & richest nations using data from latest **FAO Food Balance sheets** & provide **suggested dietary changes** for the improved health & well-being



Why Food Matters:

Hunger & food insecurity remain as one of the most devastating problems facing the world's poor, and continues to dominate the health & socio-economic development of the world's poorest nations & peoples



Not surprising since **12.7%** of the world's population live at or below the international poverty line of **\$1.90/day** (**896 million in 2012**) & growing **income inequality** which obscures the true economic hardship of the low-income segment of the population: especially **women & children**

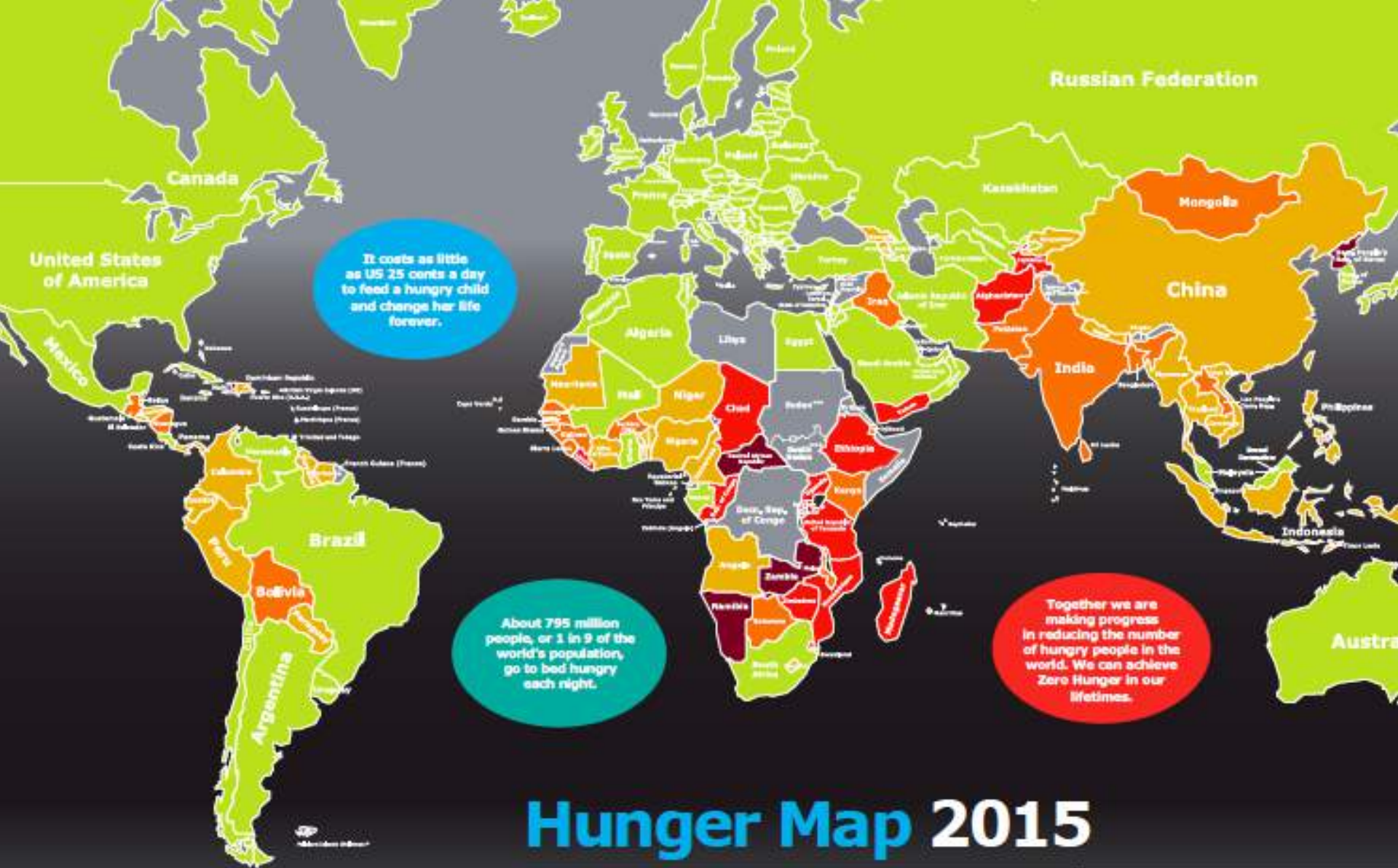
The State of Food Insecurity in the World



Meeting the 2015
international hunger targets:
taking stock of uneven progress

According to the FAO
about **795 million people**
in the world are
undernourished and do
not have enough food to
lead a healthy & active
life or about **1 in 9**
people on earth.

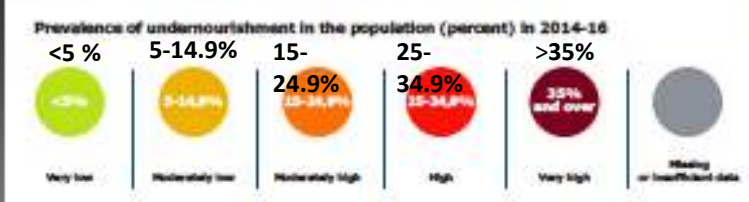




Hunger Map 2015



World Food Programme



The map shows the prevalence of undernourishment in the population of developing countries as of 2014-16. The prevalence of undernourishment is defined as the proportion of the population who are unable to access sufficient food for an active and healthy life.

Source: WFP, 2014 and 2015. The State of Food Security in the World 2015. Ending the 2015 Millennium Development Goal target of halving the number of hungry people by 2015. www.wfp.org/publications/state-of-food-security

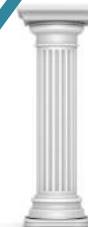
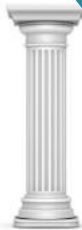
© 2015 World Food Programme

The WFP is a United Nations organization. It is a humanitarian organization that works to end hunger and malnutrition in the world. It is a leading organization in the world in the field of food security and nutrition. It is a leading organization in the world in the field of food security and nutrition. It is a leading organization in the world in the field of food security and nutrition.

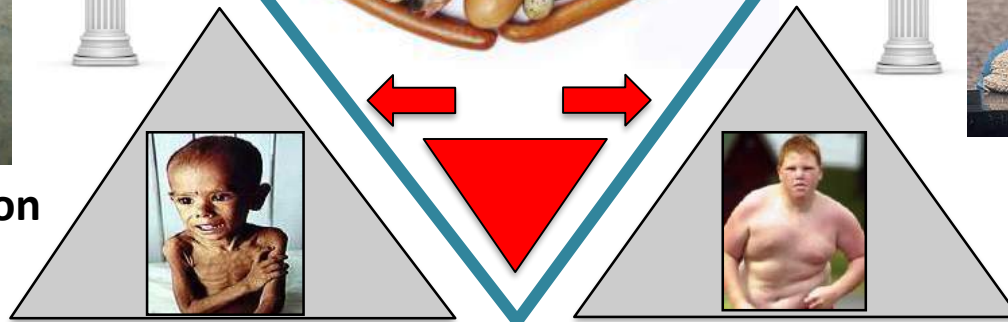
Nutrition & Food Supply is the cornerstone that dictates the health & wellbeing of **ALL** people: both **RICH & POOR**



Under-nutrition



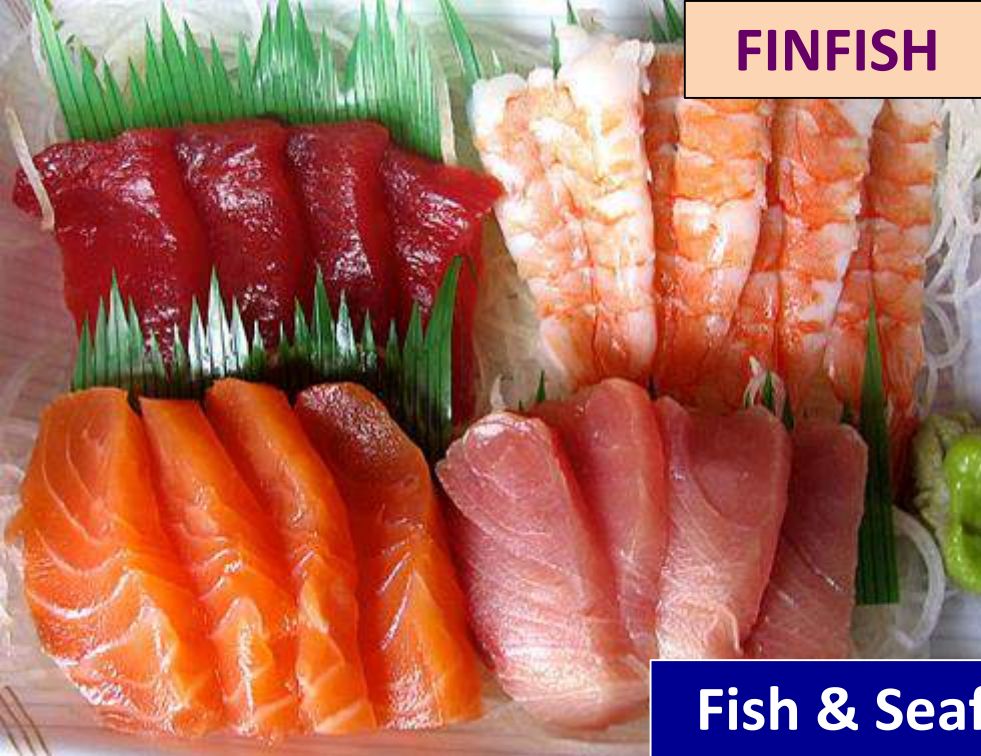
Over-nutrition



HUNGER & MALNUTRITION
Is the # 1 killer & cause of suffering on earth

FINFISH

MOLLUSCS



**Fish & Seafood products
in human nutrition**





CRUSTACEANS

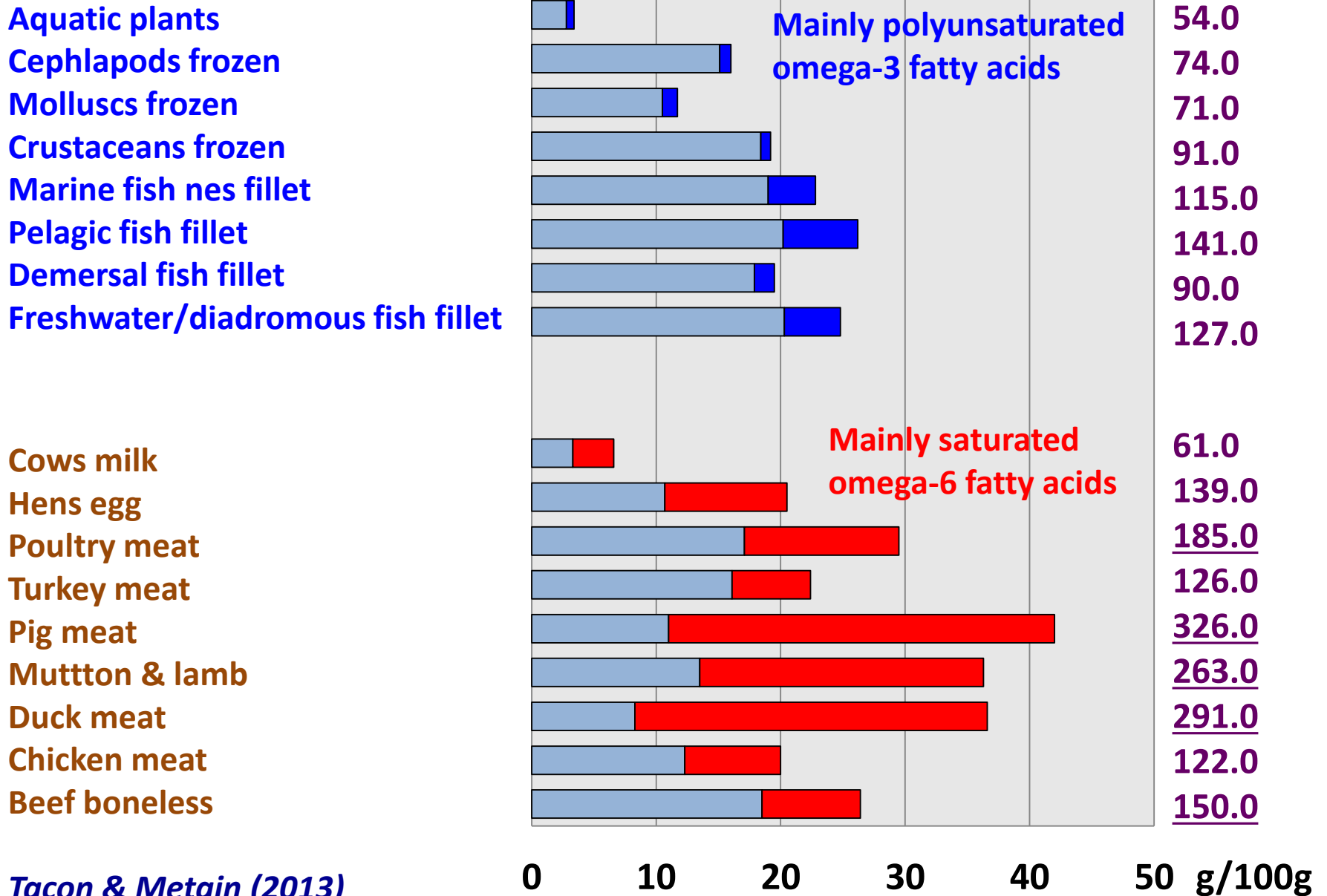
AQUATIC PLANTS



In many developing countries fish is one of cheapest & richest sources of animal protein & essential nutrients

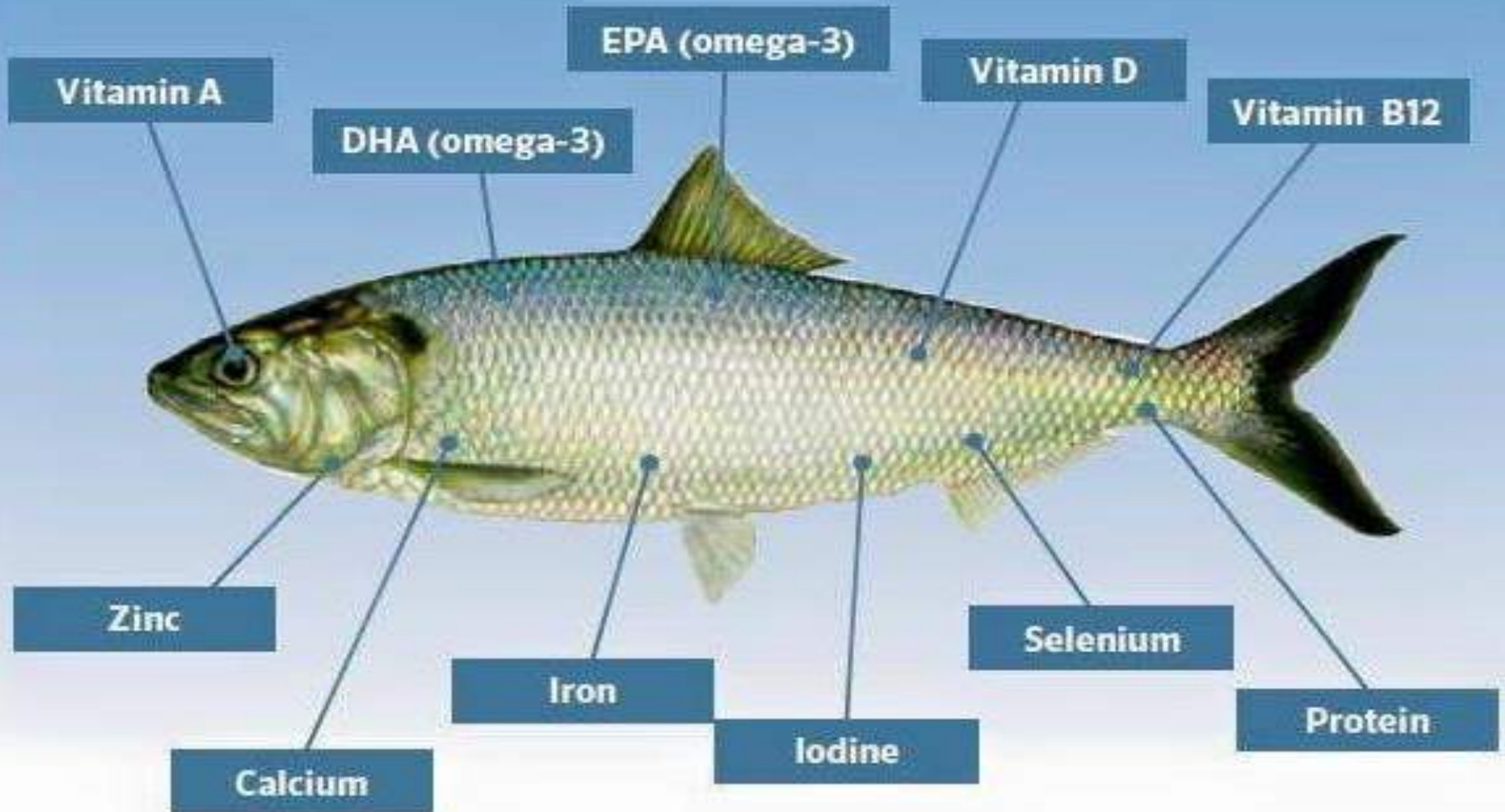
Composition of different foods

Protein  Fat  kcal/100g 



Fish: Nature's superfood

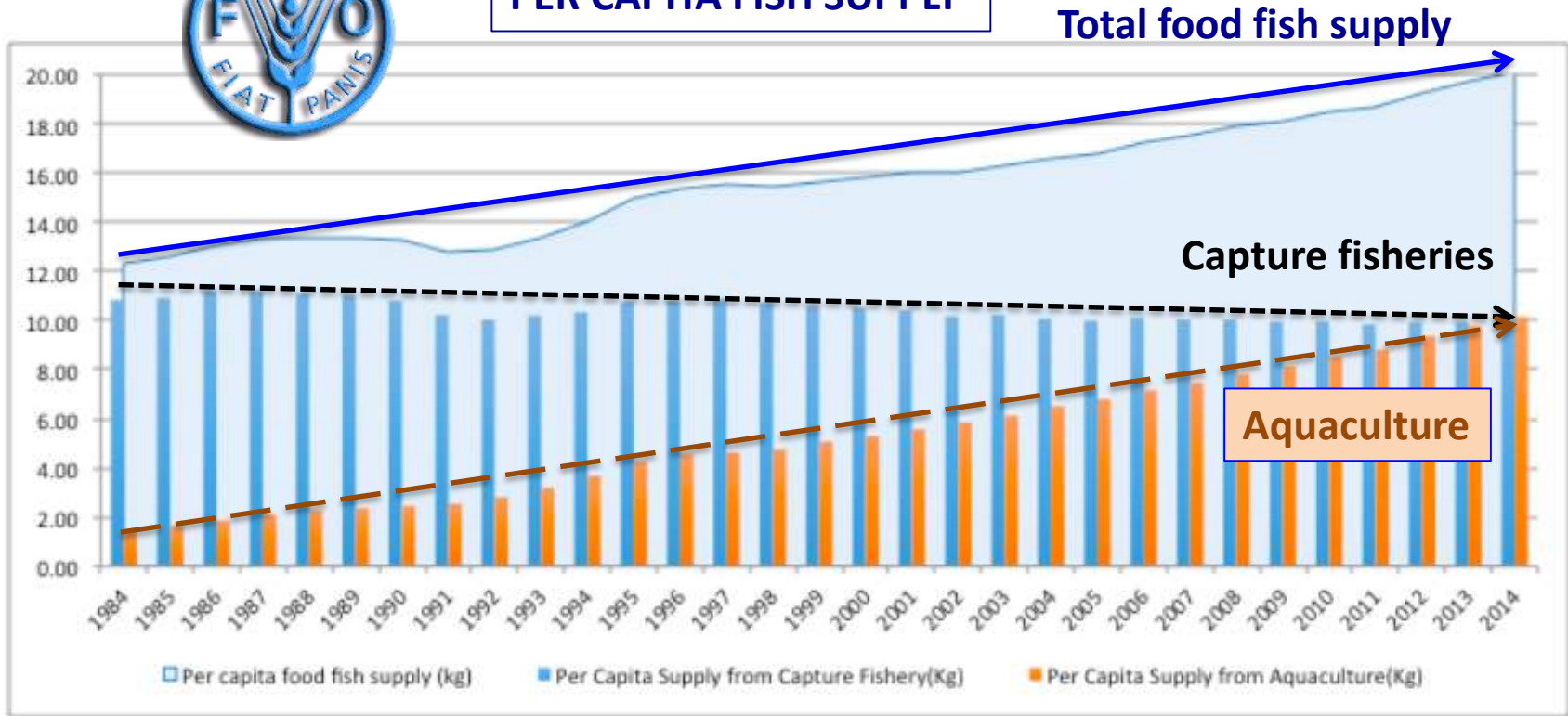
Its very close



.. Phosphorus, Magnesium, Manganese, Fluorine, Folic acid, Choline & Vitamin E ..



PER CAPITA FISH SUPPLY

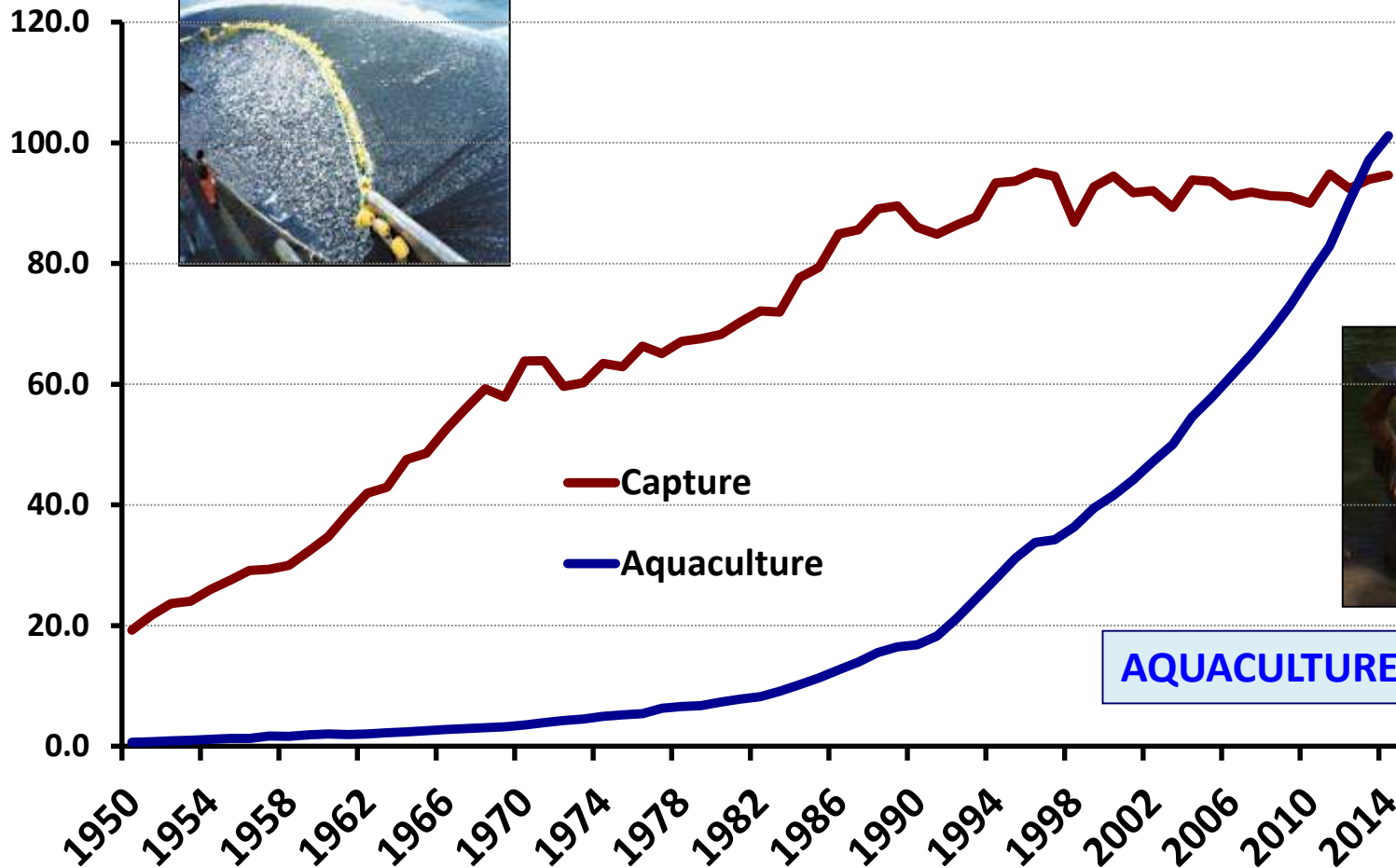


Although fish has been an integral part of the human diet since mankind first roamed earth, **increasing fishing pressure** & increasing market demand for aquatic food products has been such that per capita food fish supply from capture fisheries landings has not been able to keep pace with population growth since the mid-80s, **with reported total fisheries landings stagnating at between 90-95 million tonnes since then.**

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



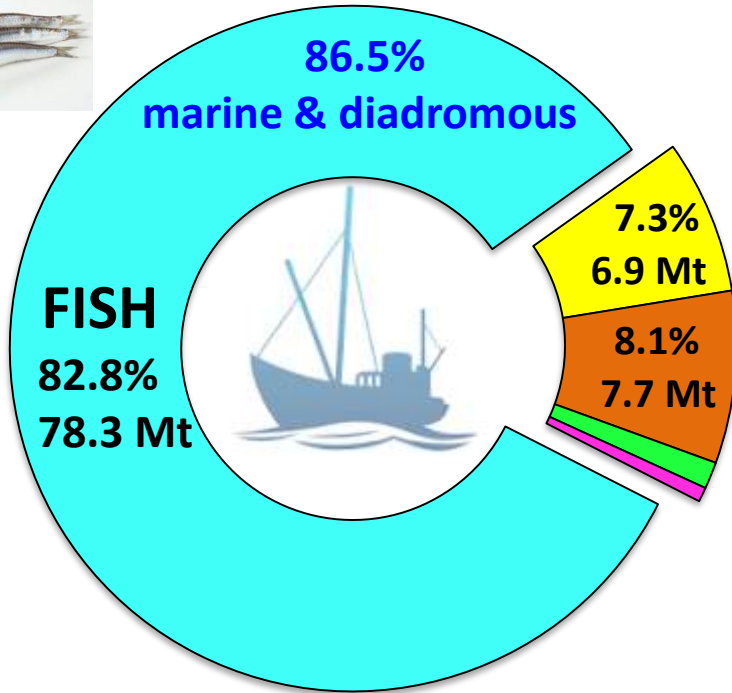
CAPTURE FISHERIES

2014

AQUACULTURE

FISH

MACRO-ALGAE



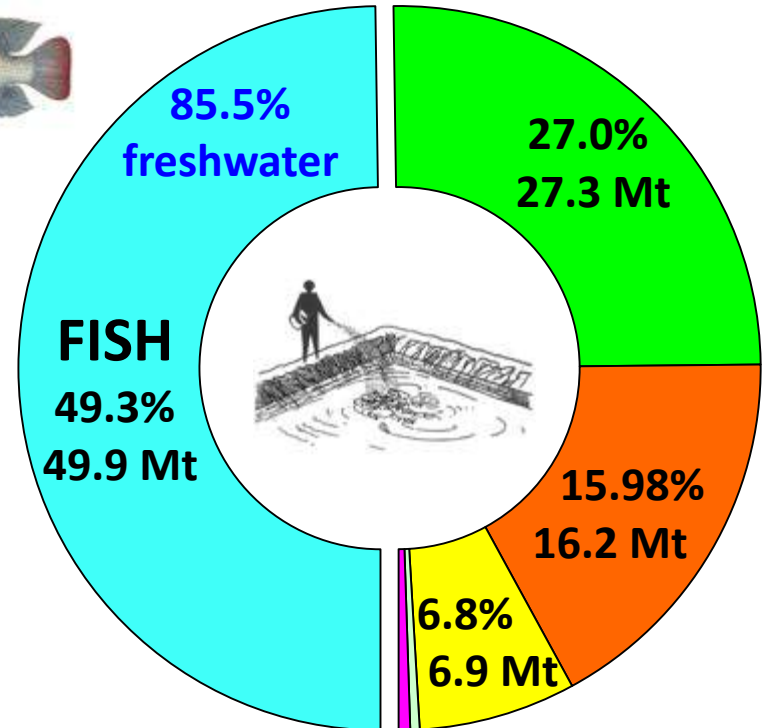
Production
94.64 Million tonnes

MOLLUSCS

CRUSTACEANS

FISH

MACRO-ALGAE



Production
101.14 Million tonnes

MOLLUSCS

CRUSTACEANS



CAPTURE FISHERIES

2014

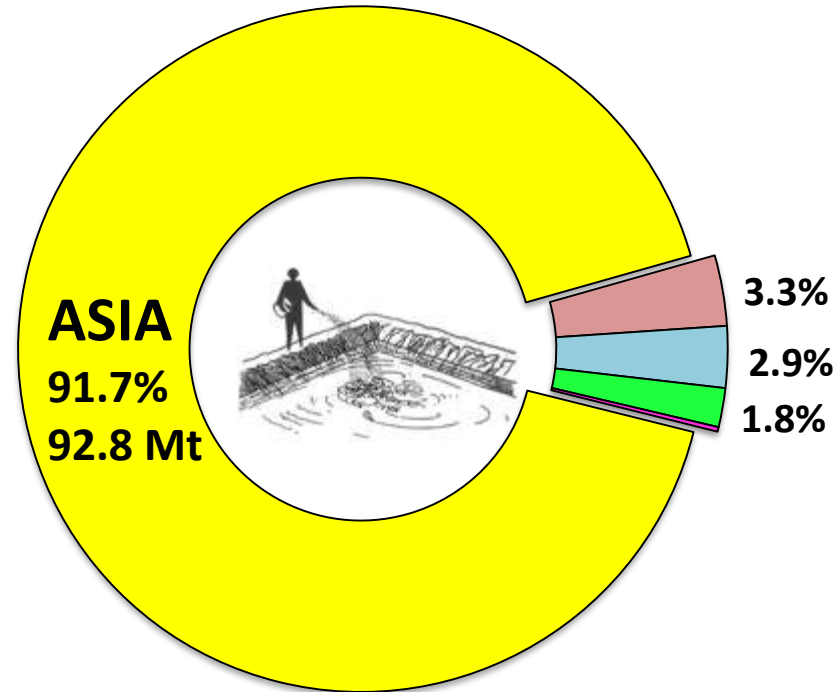
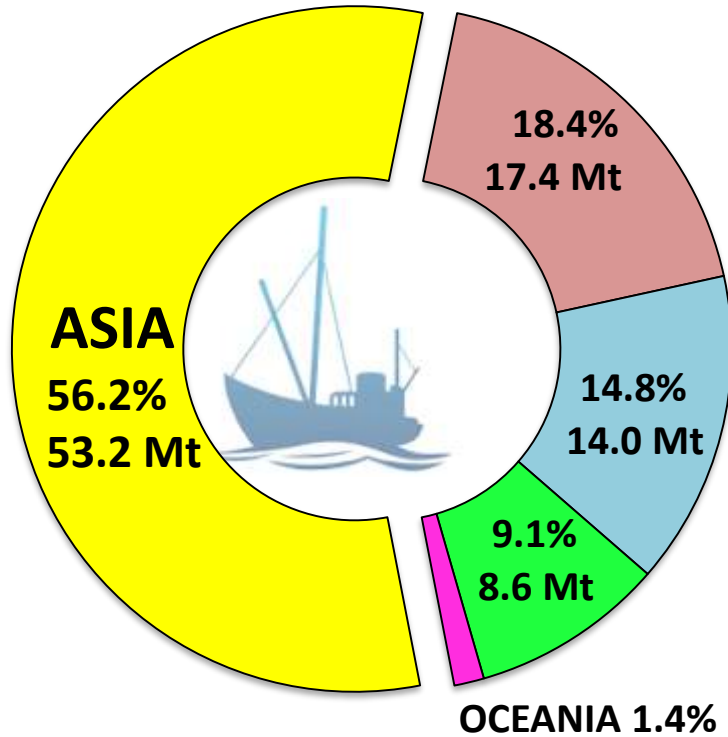
AQUACULTURE

ASIA

AFRICA

ASIA

AFRICA



Production

94.64 Million tonnes



Production

101.14 Million tonnes

EUROPE

AMERICAS

EUROPE

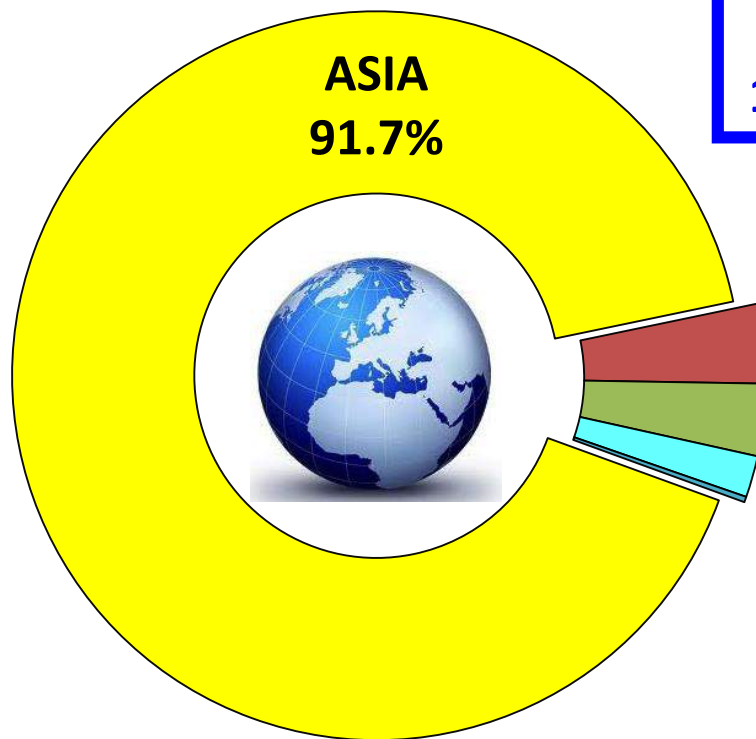
AMERICAS

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



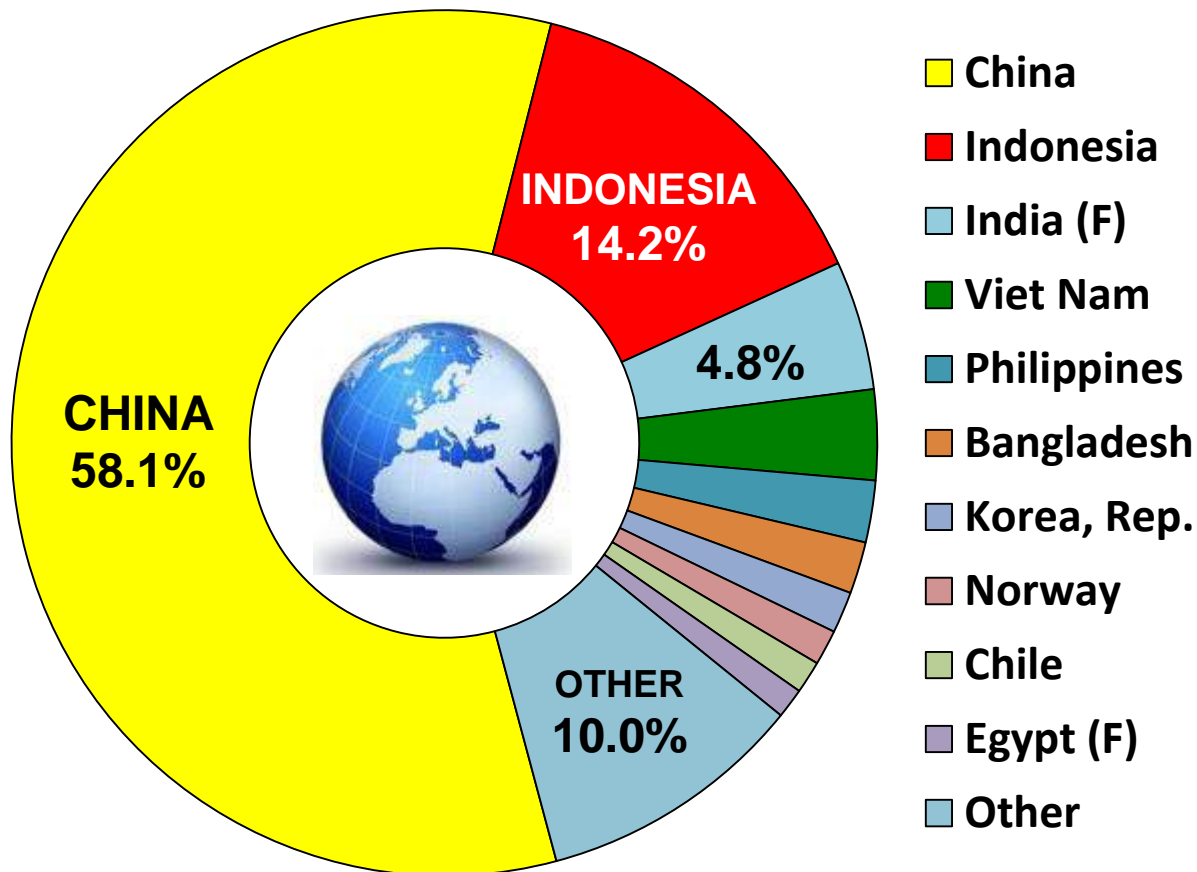
DEVELOPING COUNTRIES	96,374,378 (95.3%)	APR 6.9%
DEVELOPED COUNTRIES	4,764,694 (4.7%)	APR 1.1%

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



Fish Production by Gross National Income in 2015 (World Bank, 2016)

80 High-income economies: GNI > \$12,476

Including Australia, Canada, Chile, Japan, Korea Rep., Saudi Arabia, Taiwan, USA & most European countries

55 Upper middle-income economies: GNI \$4,036 < \$12,475

Including Brazil, China, Ecuador, Iran, Malaysia, Mexico, Peru, Russian Federation, South Africa, Thailand, Turkey

52 Lower middle-income economies: GNI \$1,026 < \$4,035

Including Bangladesh, Cambodia, Egypt, India, Indonesia, Nigeria, Philippines, Vietnam

31 Low-income economies: GNI < \$1,025

Including Afghanistan, Haiti, Korea DPR, Madagascar, Mozambique, Nepal, Uganda & a total of 27 African countries



Fish Production by Economic Country Grouping (FAO, 2016)

Capture Fisheries

Capture

	GNI Grouping		2014	2000	1984	APR
China	Upper-middle	●	17.35	14.62	3.94	0.5
Indonesia	Lower-middle	●	6.51	4.16	1.98	1.3
USA	High-income	●	4.98	4.76	4.72	0.1
India	Lower-middle	●	4.72	3.73	2.30	0.7
Russian Fed	Upper-middle	●	4.23	4.03	-	0.1
Myanmar	Lower-middle	●	4.08	1.09	0.61	4.0
Japan	High-income	●	3.75	5.19	11.59	-0.9
Peru	Upper-middle	●	3.60	10.61	3.32	-3.1
Viet Nam	Lower-middle	●	2.92	1.63	0.66	1.7
Chile	High-income	●	2.59	4.55	4.66	-1.6
Norway	High-income	●	2.45	2.89	2.58	-0.5
Philippines	Lower-middle	●	2.35	1.90	1.60	0.6
Thailand	Upper-middle	●	1.77	3.00	2.03	-1.5
Korea Rep.	High-income	●	1.74	1.84	2.23	-0.2
Bangladesh	Lower-middle	●	1.59	1.00	0.63	1.4
Mexico	Upper-middle	●	1.53	1.35	1.13	0.4
Malaysia	Upper-middle	●	1.47	1.29	0.74	0.4
Morocco	Lower-middle	●	1.37	0.91	0.47	1.2
Spain	High-income	●	1.11	1.07	1.19	0.1
Iceland	High-income	●	1.09	2.00	1.55	-1.8

Aquaculture

Aquaculture

	GNI Grouping		2014	2000	1984	APR
China	Upper-middle	●	58.80	28.46	28.46	5.3
Indonesia	Lower-middle	●	14.37	0.99	0.99	21.0
India	Lower-middle	●	4.88	1.94	1.94	6.8
Viet Nam	Lower-middle	●	3.41	0.51	0.51	14.5
Philippines	Upper-middle	●	2.34	1.10	1.10	5.5
Bangladesh	Lower-middle	●	1.96	0.66	0.66	8.1
Korea Rep.	High-income	●	1.57	0.67	0.67	6.8
Norway	High-income	●	1.33	0.49	0.49	7.4
Chile	High-income	●	1.23	0.42	0.42	7.9
Egypt	Lower-middle	●	1.14	0.34	0.34	9.0
Japan	High-income	●	1.02	1.29	1.29	-1.7
Myanmar	Lower-middle	●	0.96	0.10	0.10	17.7
Thailand	Upper-middle	●	0.93	0.74	0.74	1.7
Brazil	Upper-middle	●	0.56	0.17	0.17	8.8
Malaysia	Upper-middle	●	0.52	0.17	0.17	8.4
Korea DPR	Low-income	●	0.51	0.47	0.47	0.6
USA	High-income	●	0.42	0.46	0.46	-0.5
Ecuador	Upper-middle	●	0.37	0.06	0.06	13.7
Taiwan	High-income	●	0.34	0.26	0.26	2.0
Iran	Upper-middle	●	0.32	0.04	0.04	15.9



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Aquaculture

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Fish Production by Economic Country Grouping (FAO, 2016)

China & Indonesia had the highest total reported production from aquaculture (58.8 & 14.4 Mt) and from capture fisheries landings (17.4 & 6.5 Mt) in 2014, respectively

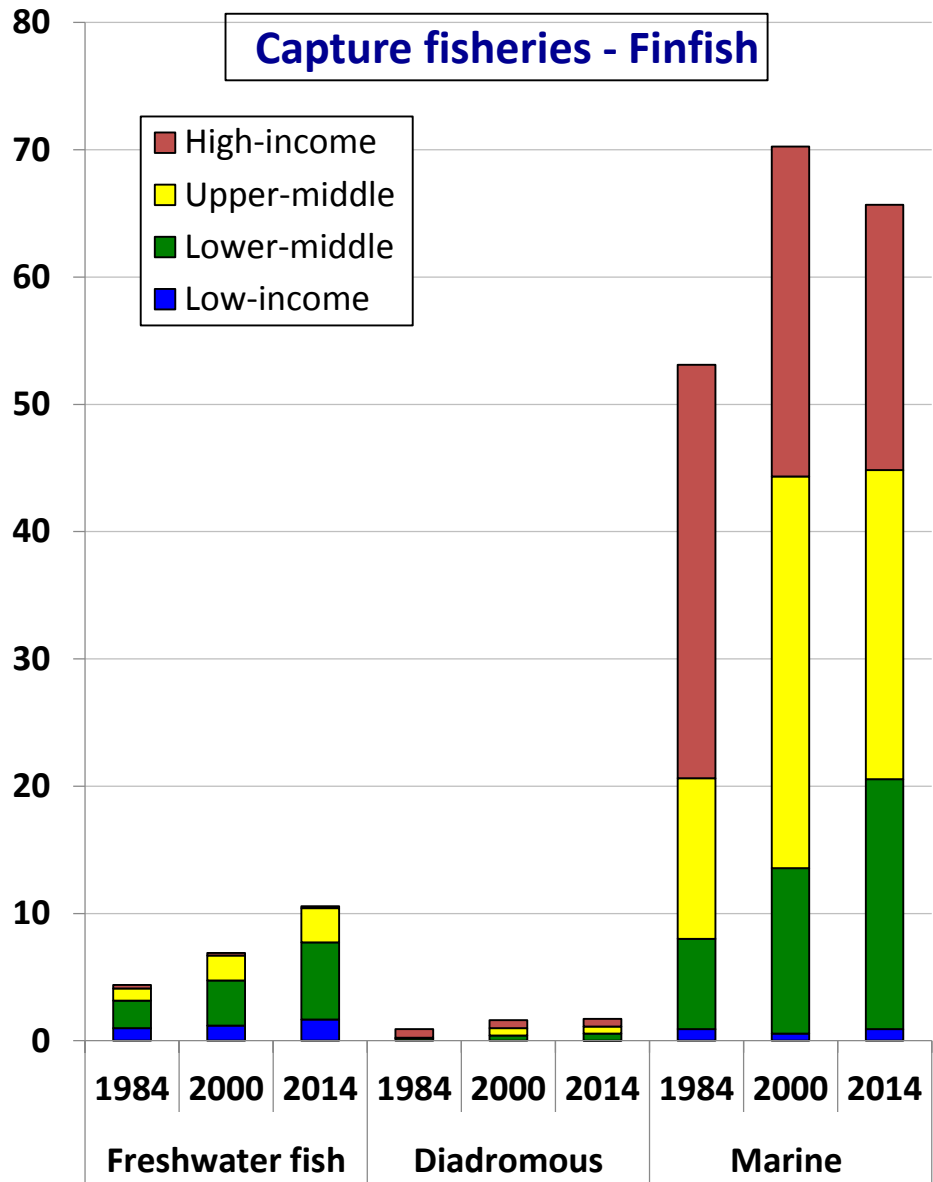
Aquaculture production in 2014 exceeded capture fisheries landings in China (by 239%), Indonesia (by 121%), India (by 3%), Vietnam (by 17%), Bangladesh (by 26%) & Egypt (by 235%)

Total capture fisheries landings in 2014 exceeded aquaculture production in the USA (by 1,086%), the Russian Federation (by 2,544%), Myanmar (by 325%), Japan (by 268%), Peru (by 2,900%), Chile (by 110% & Norway (by 84%)

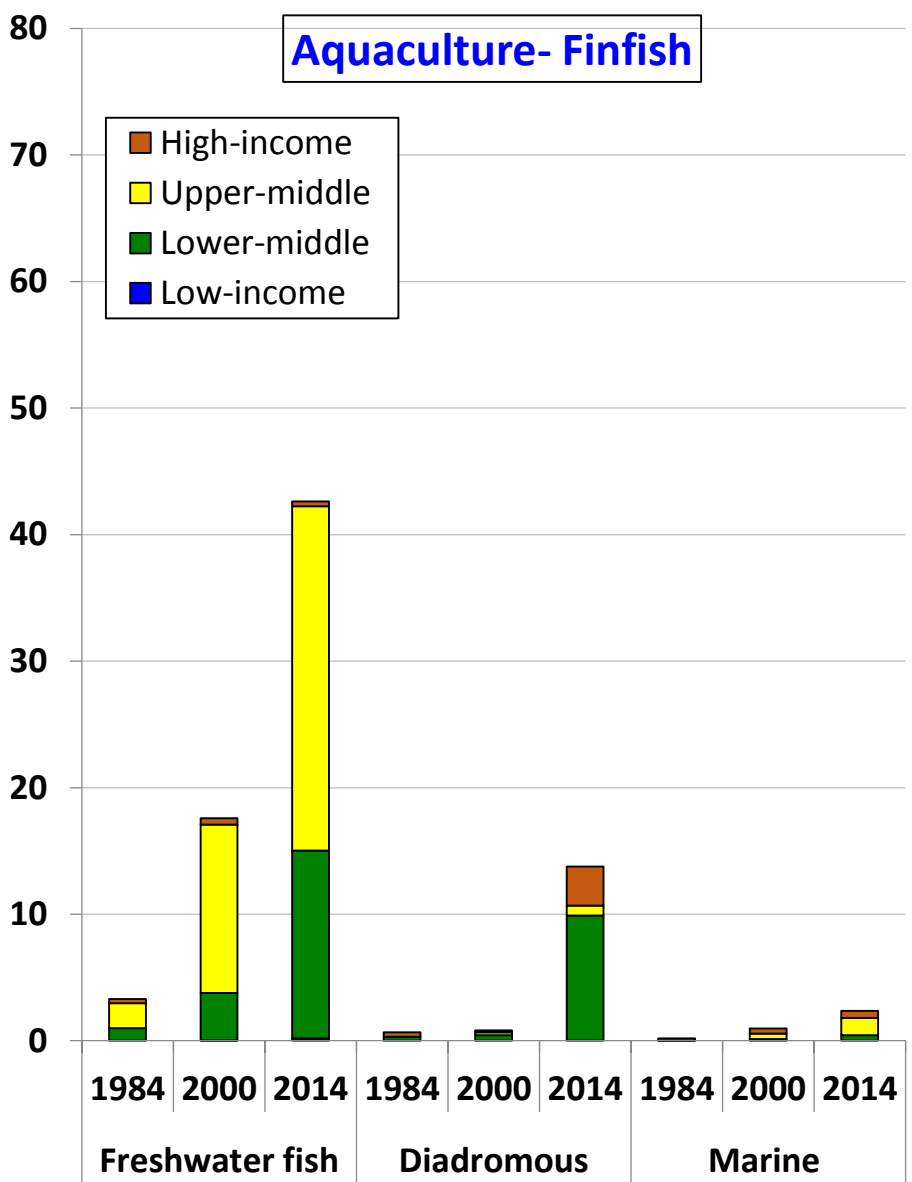


Finfish production by Gross National Income groupings for 1984, 2000 and 2014 from capture fisheries and aquaculture (FAO, 2016; World Bank, 2016)

Capture fisheries - Finfish



Aquaculture - Finfish



Role of fish & fishery products in the national food balance sheets

Global per capita fish supply **19.7 kg** **2013** (FAO, 2016)

Central America	9.1 kg
Africa	9.9 kg
South America	10.0 kg
Northern America	21.7 kg
Europe	21.9 kg
Asia	23.1 kg
Oceania	24.8 kg



Low-income countries	7.9 kg (mean of 31 countries)
Lower-middle income countries	16.5 kg (mean of 51 countries)
Upper-middle income countries	18.7 kg (mean of 55 countries)
High-income countries	30.3 kg (mean 69 countries)



Role of fish & fishery products in the national food balance sheets

Contribution of fish to animal protein supply

2013 (FAO, 2016)

Global	16.8 %
Africa	18.1 %
South America	6.7 %
Central America	7.3 %
Northern America	7.5 %
Europe	11.4 %
Asia	22.9 %
Oceania	10.4 %
Low-income countries	21.6 % (mean of 31 countries)
Lower-middle income countries	20.7 % (mean of 51 countries)
Upper-middle income countries	13.4 % (mean of 55 countries)
High-income countries	15.1 % (mean 69 countries)



Role of fish & fishery products in the national food balance sheets

Despite the **low per capita consumption of fish** within the **African region**, fish represents a **major source of animal protein & other essential nutrients** within many **low-income and lower-middle income African countries**, including:

Sierra Leone **65.0%**, Ghana **49.8%**, São Tomé & Príncipe **48.8%**, Senegal **42.5%**, Comoros **41.3%**, Mozambique **38.7%**, Nigeria **38.2%**, Congo Democratic Republic **37.8%**, Togo **36.9%**, Congo Republic **36.7%**, Côte d'Ivoire **34.7%**, Cameroon **33.8%**, Uganda **31.7%**, Burundi **28.1%**, Guinea **26.8%**, Benin **24.6%**, Malawi **24.4%**, Egypt **24.0%**, Rwanda **22.6%**, and Morocco **22.2%**

Source: FAO (2016)



Role of fish & fishery products in the national food balance sheets

Moreover, despite the **high per capita supply of fish within most European & North American higher-income countries**, including: Belgium 25.1 kg, Canada 22.6 kg, Denmark 23.2 kg, France 33.5 kg, Greece 19.3 kg, Ireland 22.0 kg, Israel 23.2 kg, Italy 25.5 kg, Luxembourg 33.9 kg, Netherlands 22.3 kg, Sweden 30.7 kg, UK 20.8 kg and USA 21.5 kg;

Fish represents a minor source of animal protein in these countries including: Belgium **11.2%**, Canada **10.4%**, Denmark **12.7%**, France **13.1%**, Greece **8.9%**, Ireland **8.0%**, Israel **8.5%**, Italy **11.9%**, Luxembourg **11.5%**, Netherlands **9.8%**, Sweden **11.7%**, UK **9.5%** and USA/Mexico **7.3%**

Source: FAO (2016)



Role of fish & fishery products in the national food balance sheets

Top fish consumers within the **European region** included Iceland 92.0 kg, Portugal 53.8 kg, Norway 52.1 kg, Lithuania 43.9 kg, Spain 42.4 kg and Finland 36.4 kg, France 33.5 kg & Sweden 30.7 kg, with fish playing an important to total animal protein supply in Iceland **27.8%**, Norway **22.2%**, Portugal **20.2%**, Lithuania **22.5%** & Spain **19.8%**, Finland **14.2%**, France **13.1%**, Sweden **11.7%**

Lowest fish consumers were within the **Latin America & Caribbean region**, including Guatemala **1.3 kg**, Bolivia **2.2 kg**, Paraguay **3.7 kg**, Honduras **4.0 kg**, Haiti/Nicaragua **4.8 kg**, Cuba **5.5 kg**, Colombia **6.5 kg**, Uruguay **7.5 kg**, Venezuela RB **7.8 kg**, Ecuador **8.2 kg**, Dominican Republic **8.1 kg**, Mexico **9.1 kg**, Brazil/Belize **9.7 kg**, Costa Rica **12.9 kg**, Panama **13.0 kg**, Chile **13.2 kg**, Suriname **16.5 kg**, Peru **22.0 kg** & Guyana **31.1 kg**;



Role of fish & fishery products in the national food balance sheets

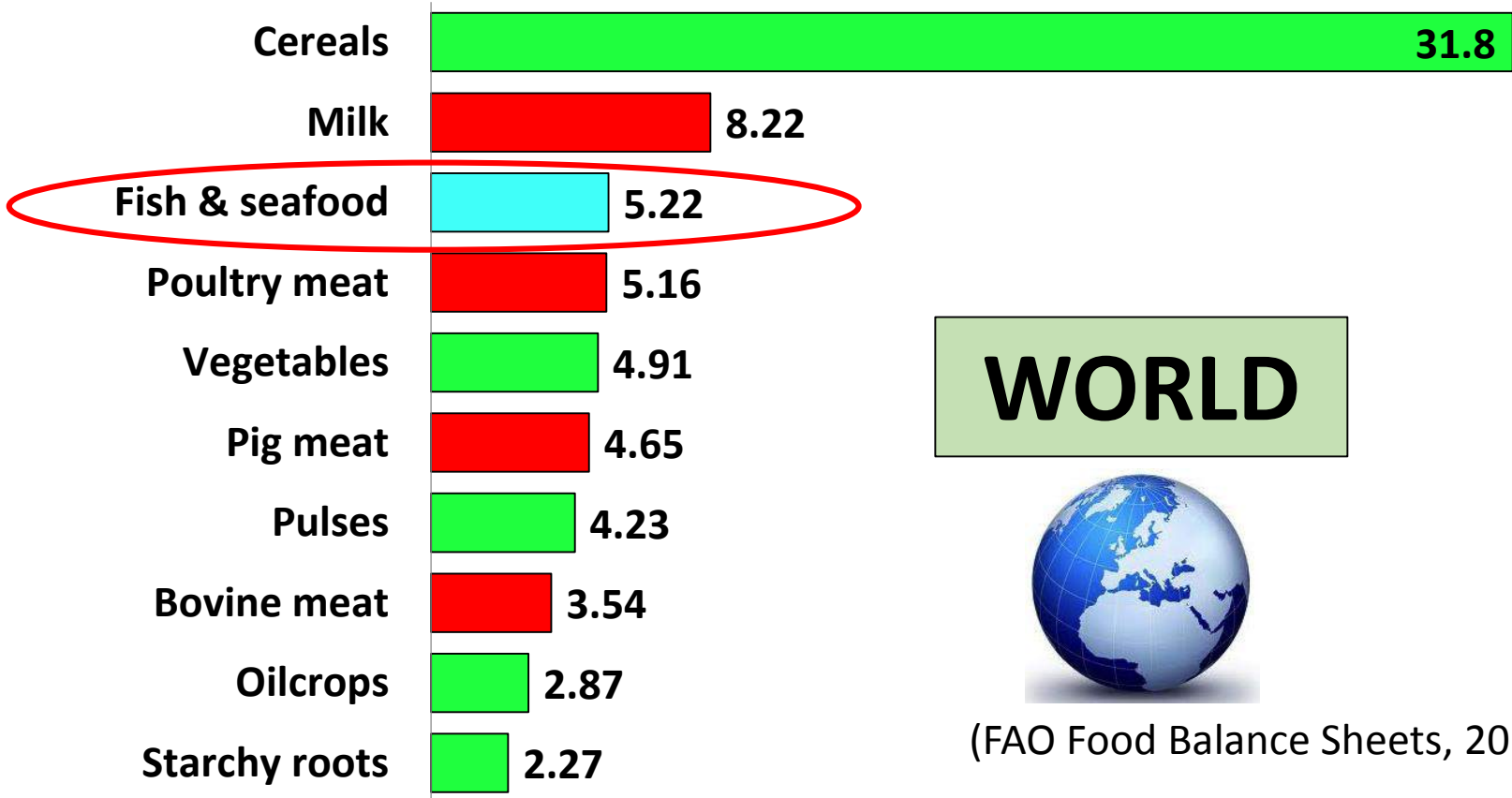
Fish consumption was generally highest within the **Asian region**, including: Myanmar **60.7 kg**, Malaysia **54.0 kg**, Korea Rep. **53.5 kg**, Japan **48.9 kg**, Brunei Darussalam **47.0 kg**, Cambodia **41.4 kg**, China **37.9 kg**, Vietnam **34.8 kg**, Indonesia **31.8 kg**, Philippines **30.2 kg**, Sri Lanka **30.1 kg**, Bangladesh **21.2 kg**, Lao DPR **19.8 kg**;

With fish also generally representing the **major source of animal protein consumed**, including: Cambodia **68.6%**, Bangladesh **56.3%**, Indonesia **55.2%**, Sri Lanka **54.2%**, Lao DPR **40.5%**, Korea Rep./Malaysia **37.7%**, Japan **36.3%**, Philippines **36.0%**, Vietnam **29.0%**, China **22.4%**, Brunei Darussalam **20.5%**

Source: FAO (2016)



Protein Supply g/day - 2013



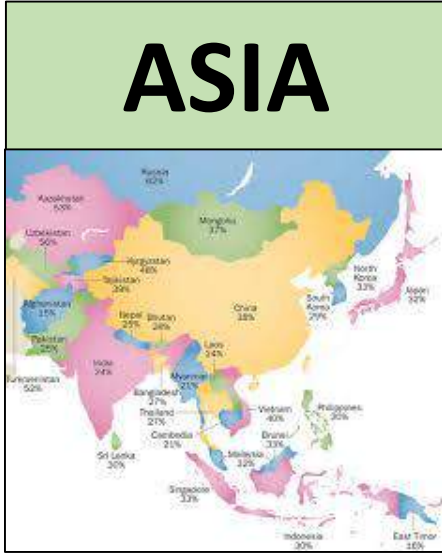
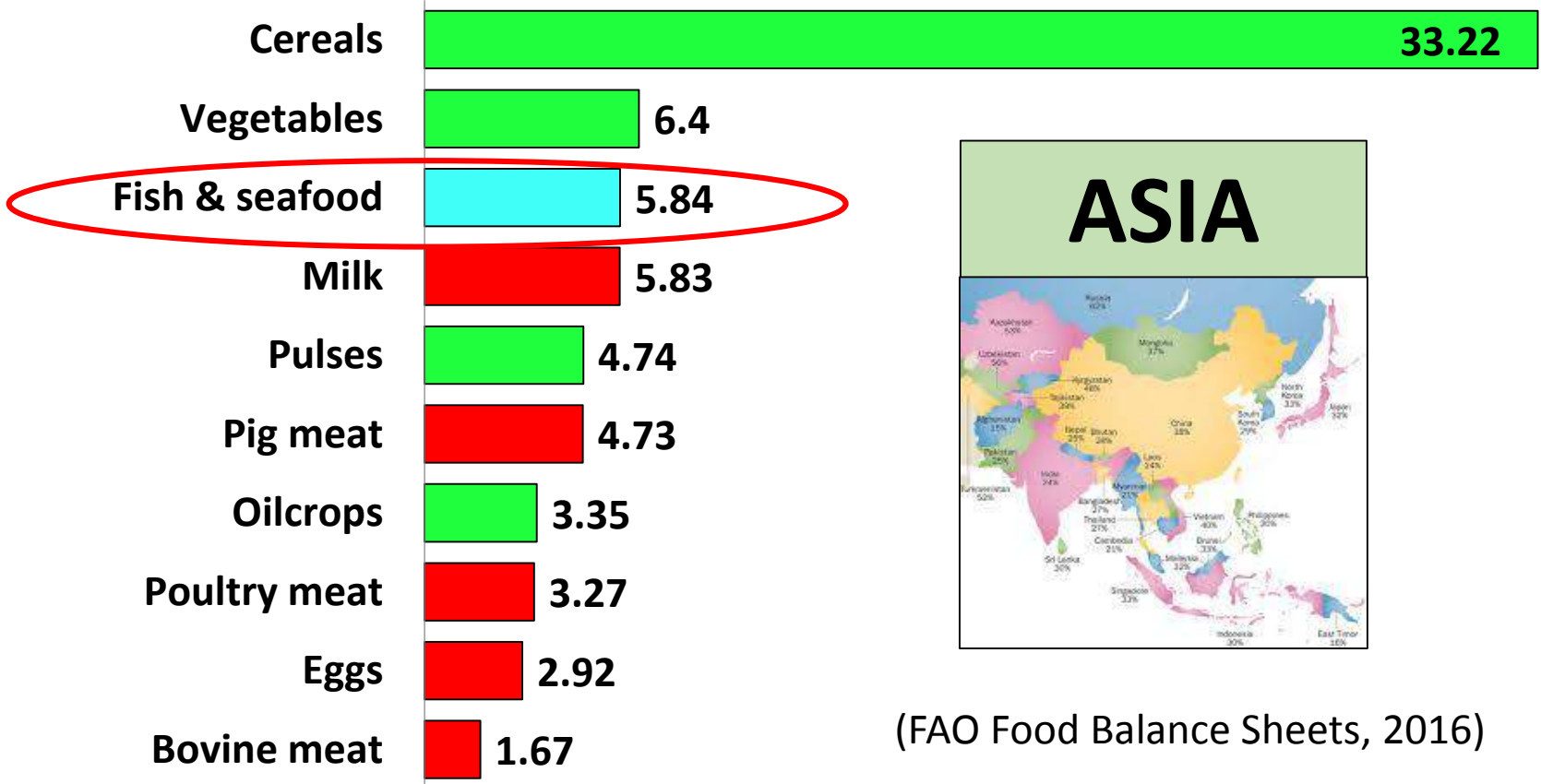
WORLD



(FAO Food Balance Sheets, 2016)



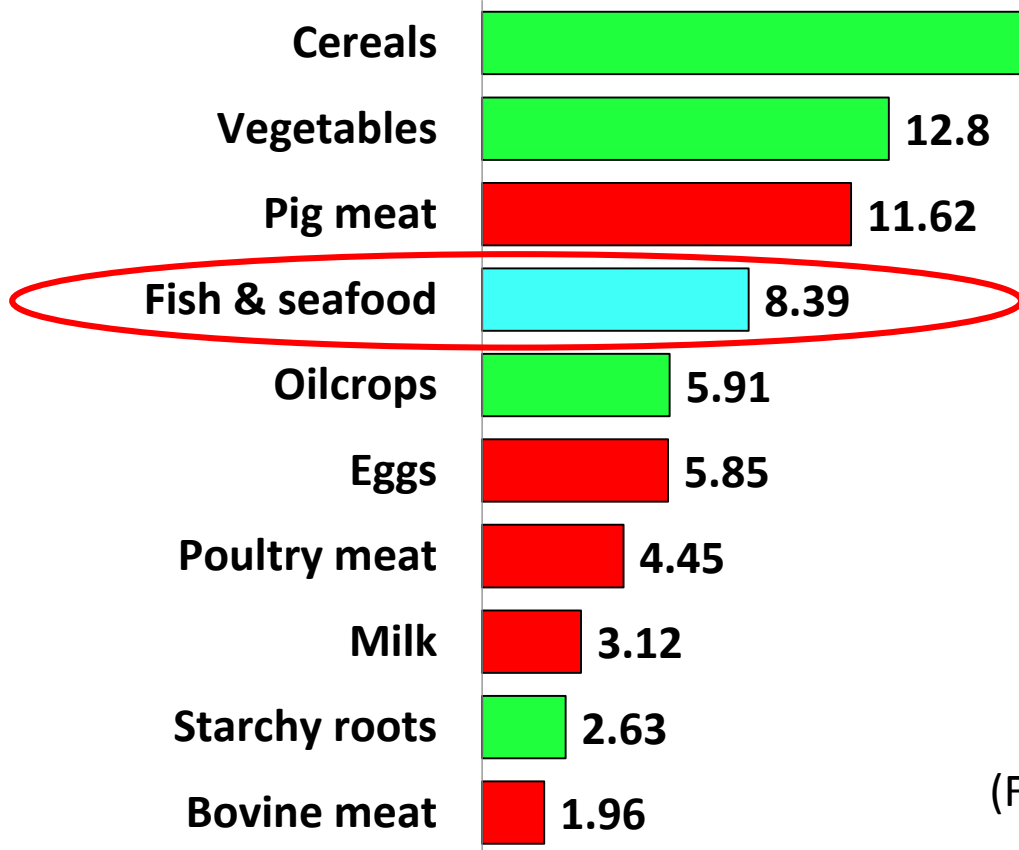
Protein Supply g/day - 2013



(FAO Food Balance Sheets, 2016)



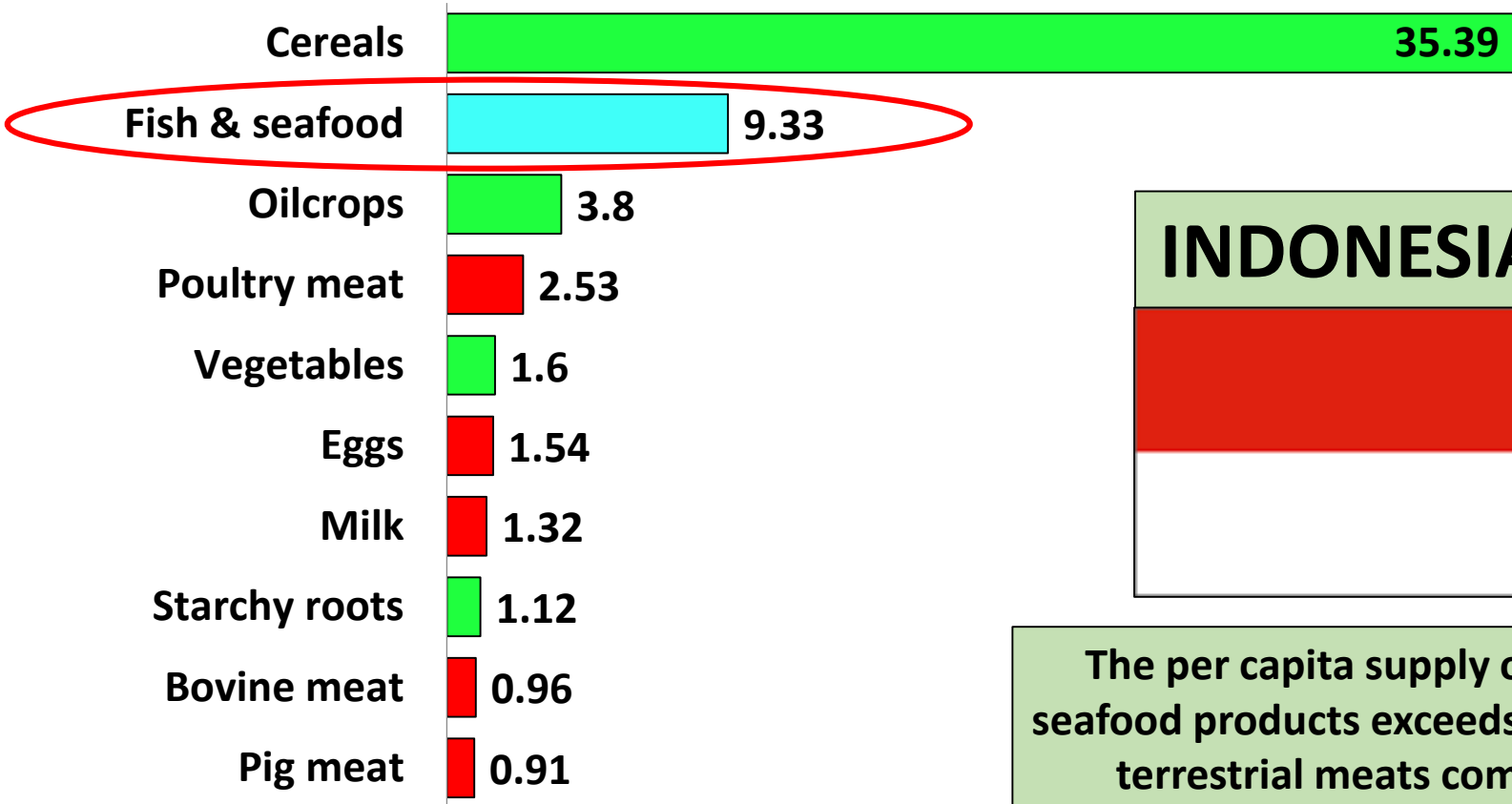
Protein Supply g/day - 2013



(FAO Food Balance Sheets, 2016)



Protein Supply g/day - 2013

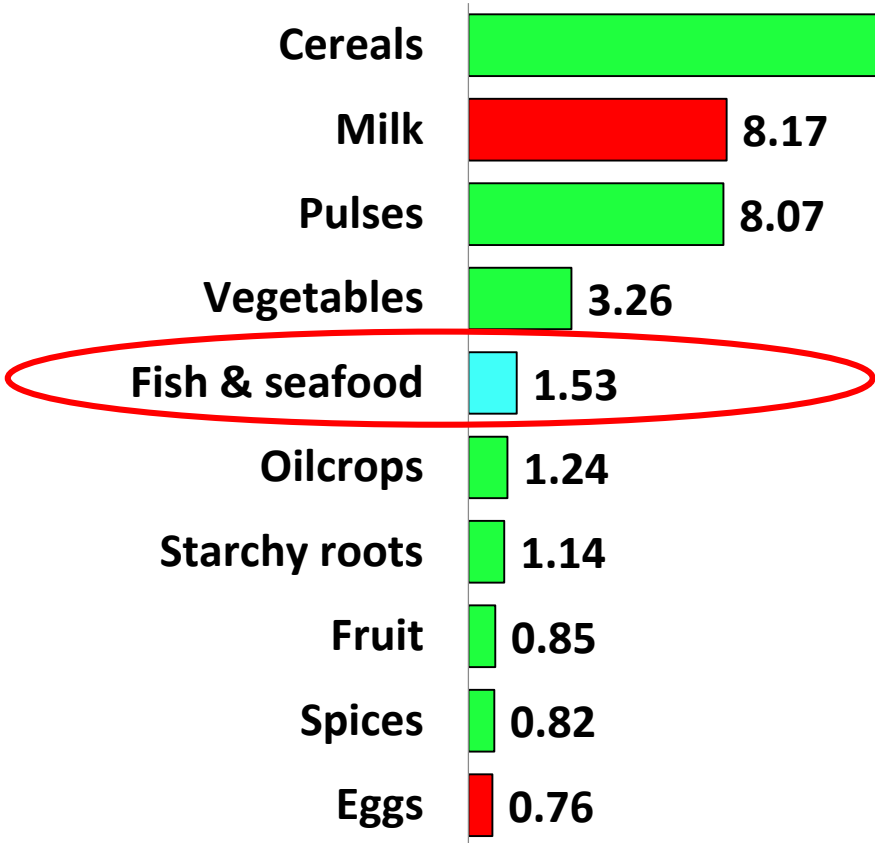


The per capita supply of fish & seafood products exceeds that of all terrestrial meats combined

(FAO Food Balance Sheets, 2016)



Protein Supply g/day - 2013

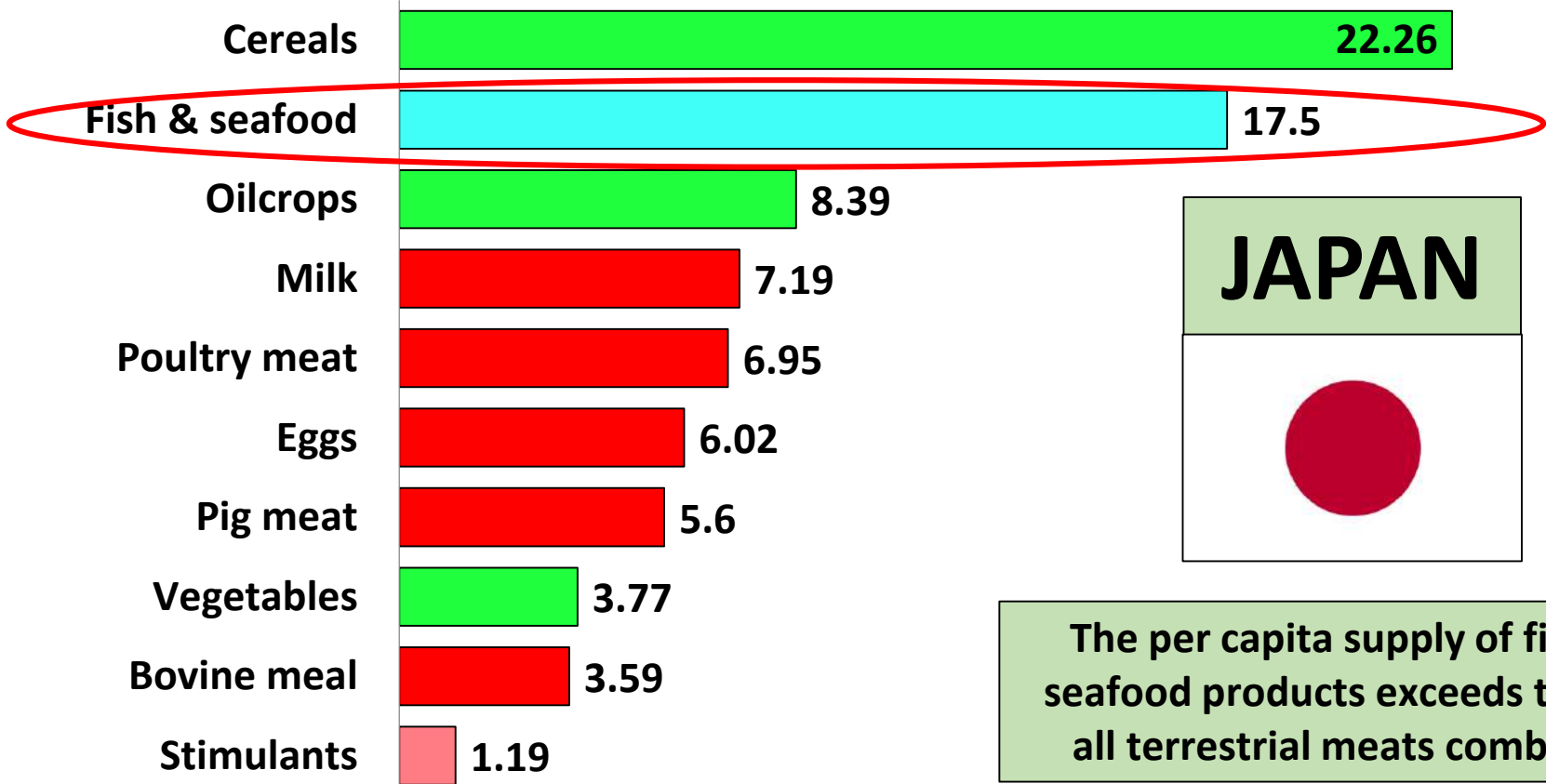


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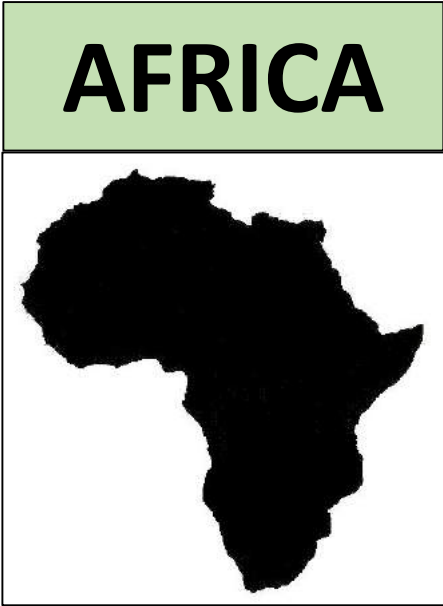
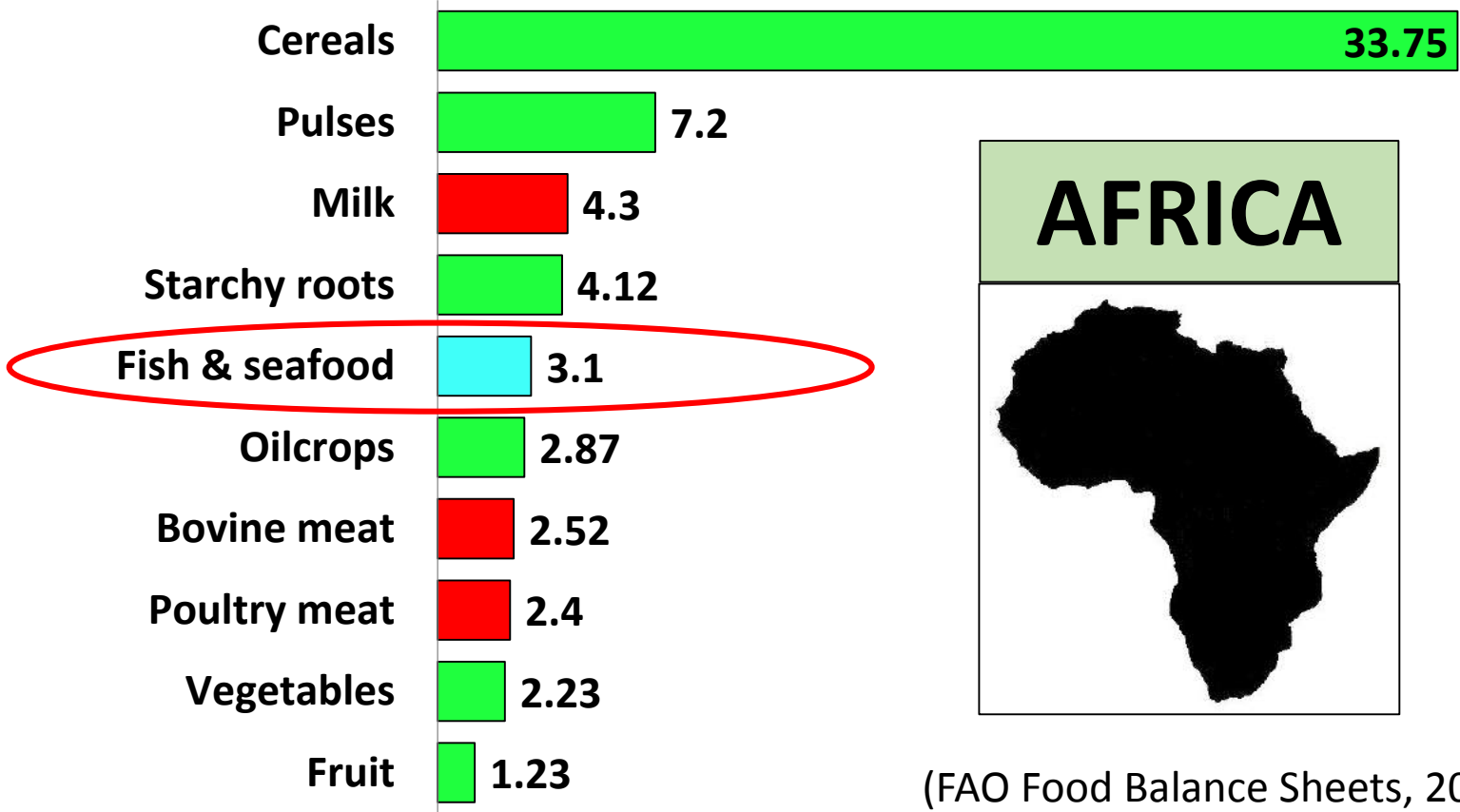
Protein Supply g/day - 2013



(FAO Food Balance Sheets, 2016)



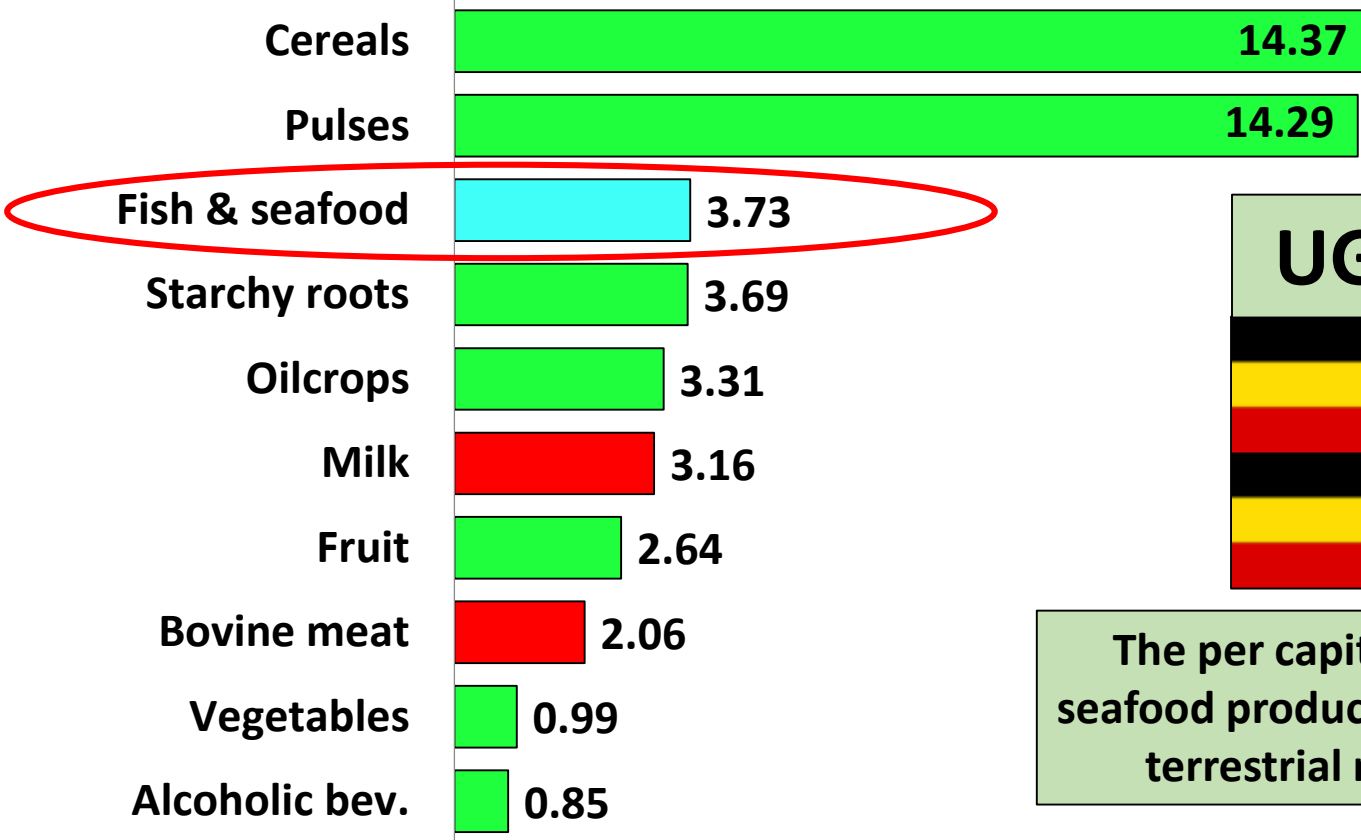
Protein Supply g/day - 2013



(FAO Food Balance Sheets, 2016)



Protein Supply g/day - 2013

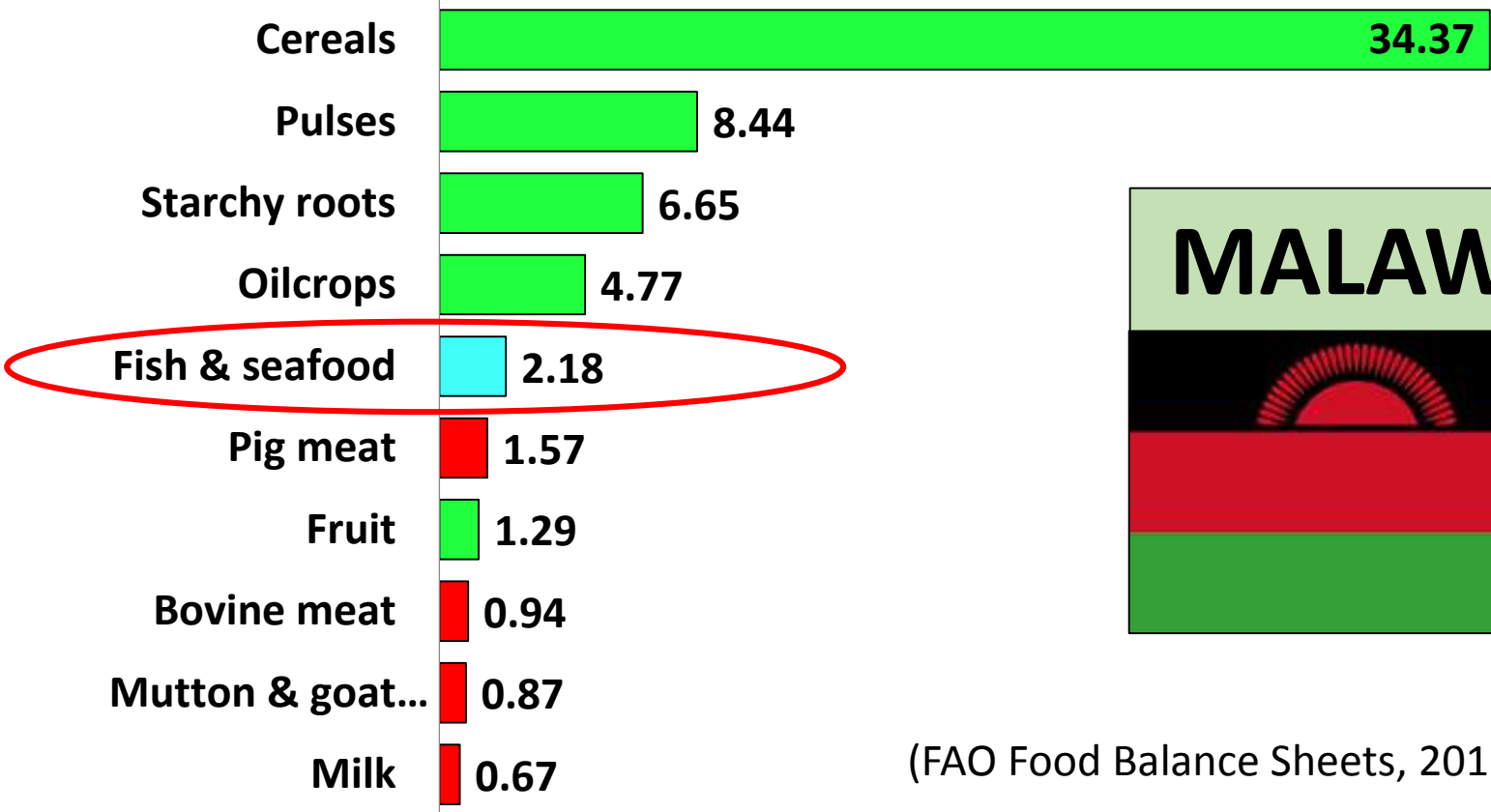


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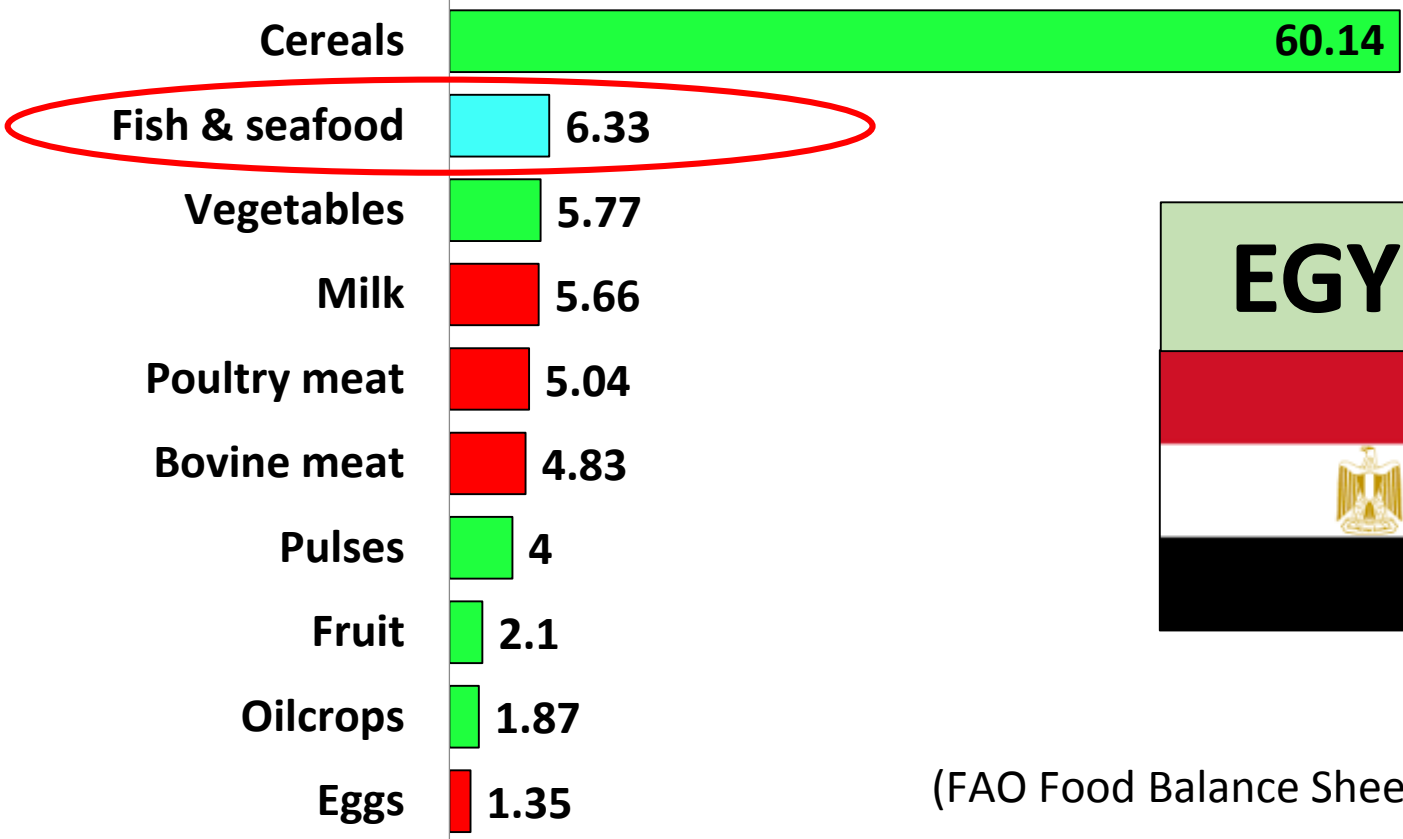
Protein Supply g/day - 2013



(FAO Food Balance Sheets, 2016)



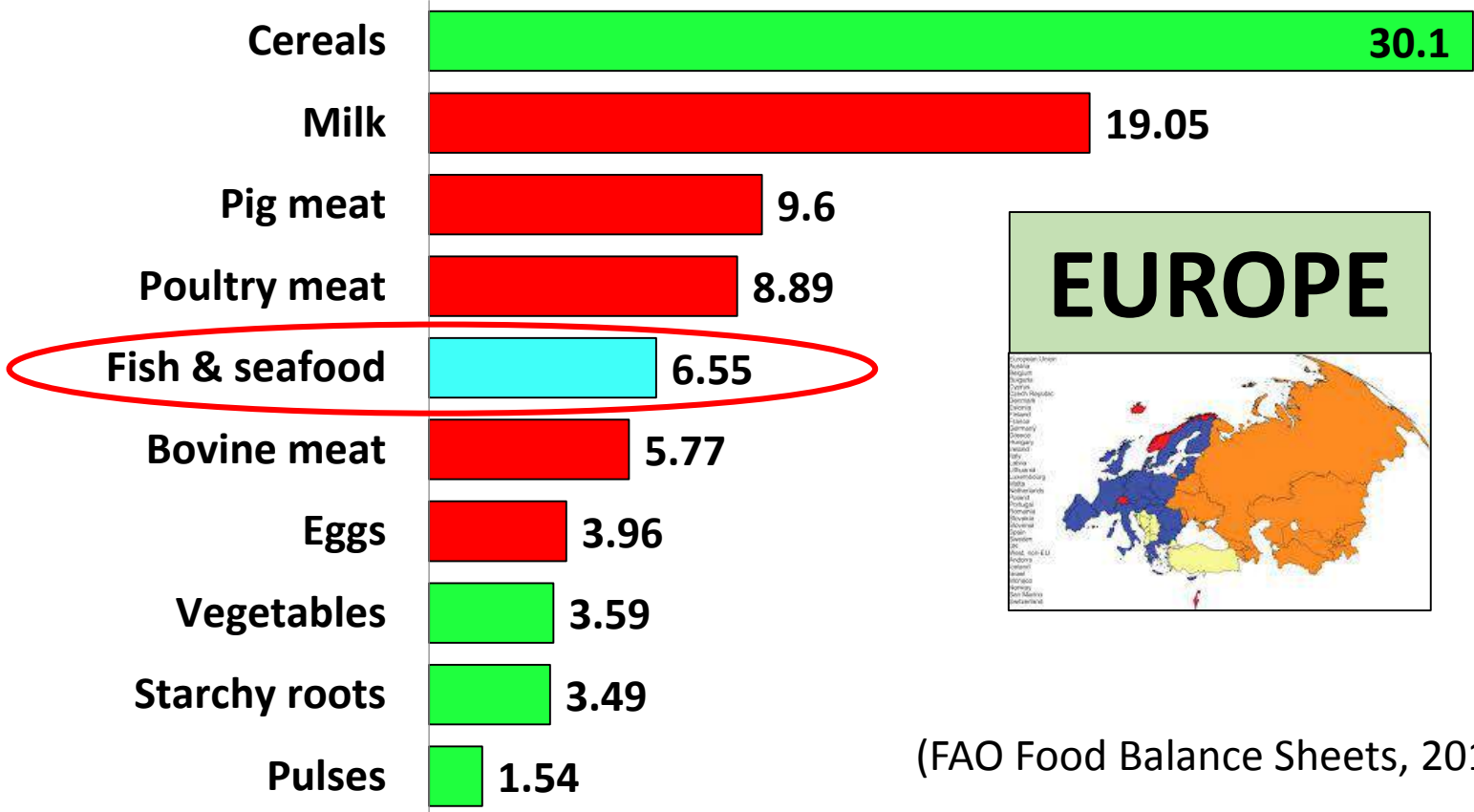
Protein Supply g/day - 2013



(FAO Food Balance Sheets, 2016)



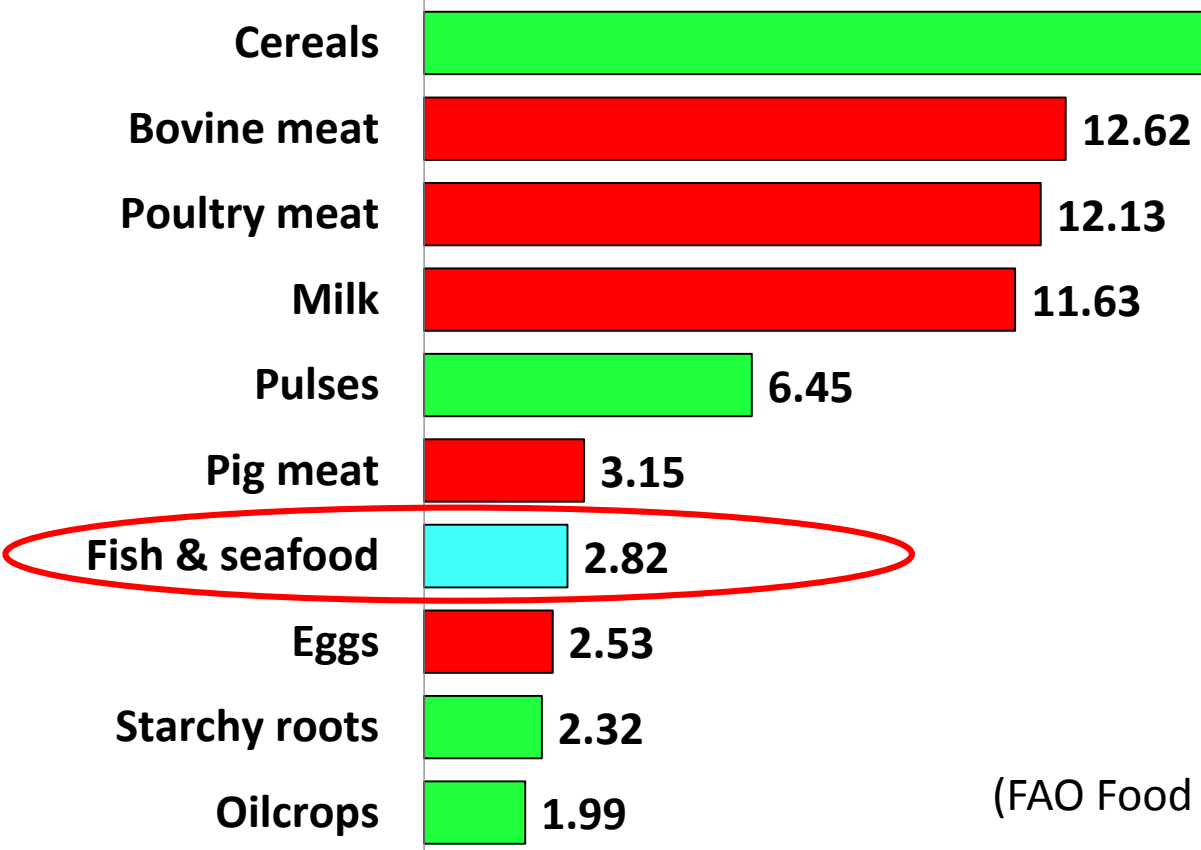
Protein Supply g/day - 2013



(FAO Food Balance Sheets, 2016)



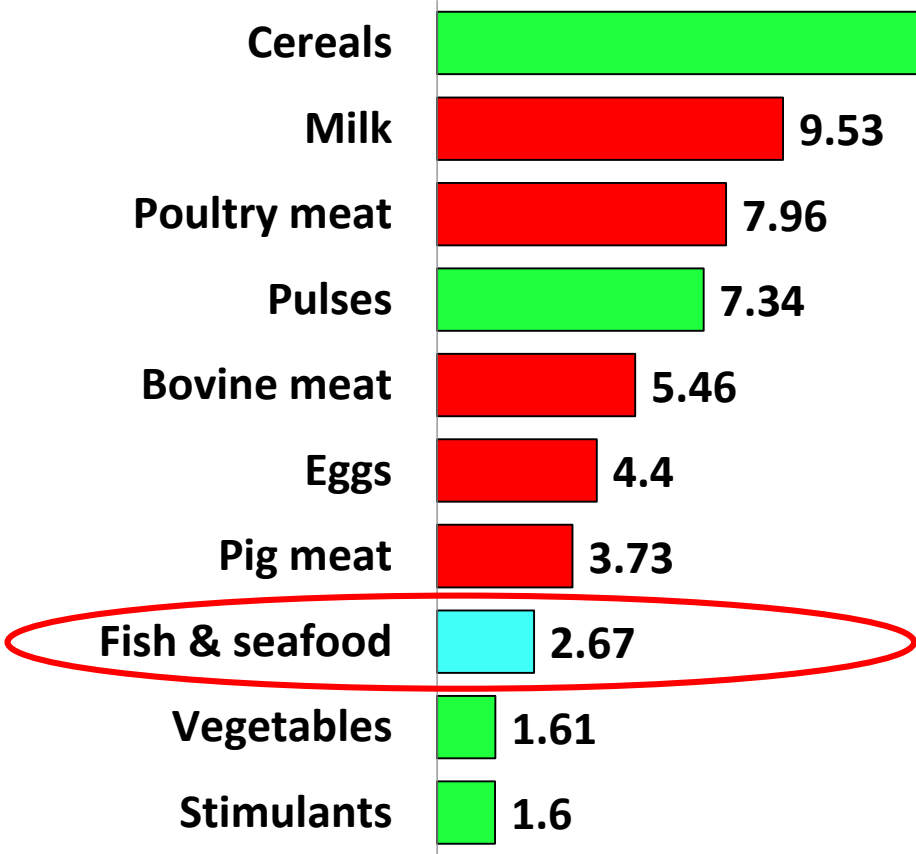
Protein Supply g/day - 2013



(FAO Food Balance Sheets, 2016)



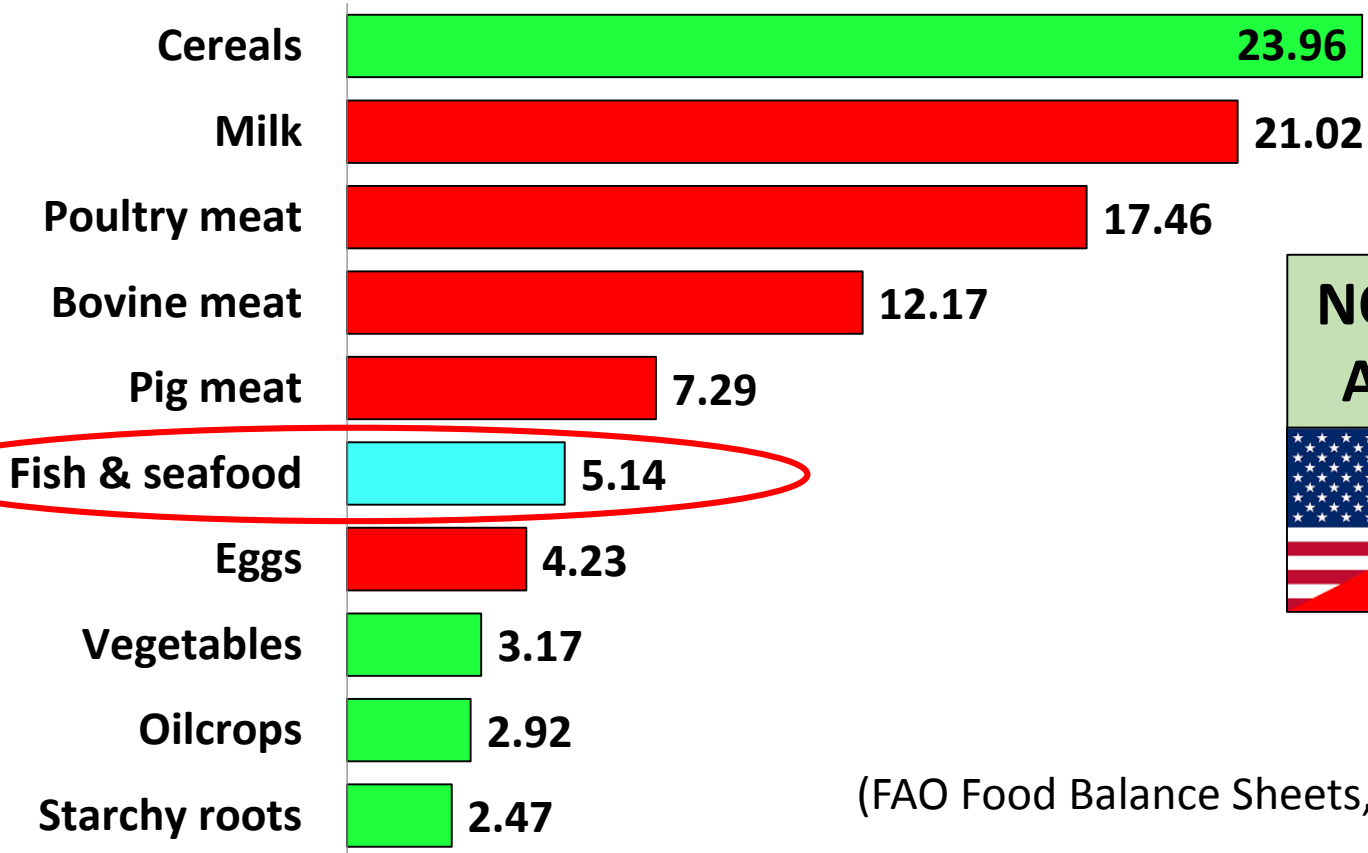
Protein Supply g/day - 2013



(FAO Food Balance Sheets, 2016)



Protein Supply g/day - 2013



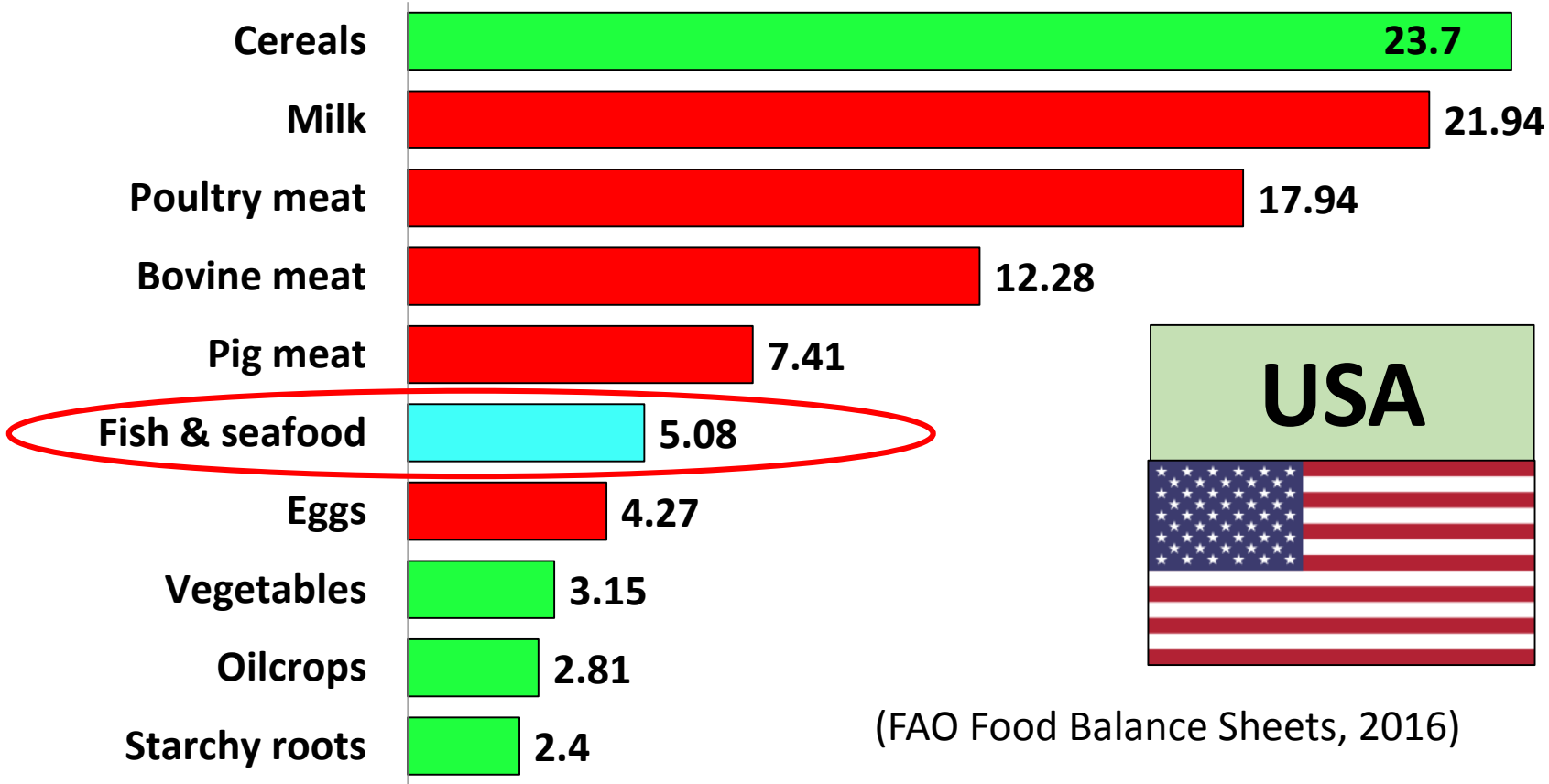
**NORTHERN
AMERICA**



(FAO Food Balance Sheets, 2016)



Protein Supply g/day - 2013



Why Fish Matters

Fish & seafood products represent an important component of the human diet, providing about **3.1 billion people** with almost **20%** of their average daily **animal protein intake**, and providing the only natural source of long-chain omega-3 polyunsaturated fatty acids for direct human consumption (including **EPA & DHA**)



Concluding remarks



The data clearly show that fish & seafood produce, whether derived from wild capture fisheries or produced through aquaculture, plays a major role as a source of dietary protein & other essential dietary nutrients. **On a global basis fish & seafood products constitute the third major source of dietary protein consumed by humans after cereals and milk, representing 6.5% of total protein supply or 16.4% of total animal protein supply.**

Moreover, it is also clear that fish & seafood plays **a greater role in the nutrition of low-income countries** within the **African** continent (primarily derived from capture fisheries) and within the **Asian** region in general (primarily derived from aquaculture).



Concluding remarks

Plant & vegetable produce comprise over **90%** of the total dietary energy supply within most **low-income & lower-income** countries, including Nigeria 96.2%, Malawi 94.1%, Indonesia 93.4%, Africa 91.8%, LIFDCs 91.5%, Uganda 91.4%, Egypt 90.6%, India 90.4%;

Sugars & sweeteners contribute over **10%** of total dietary energy supply in most high-income countries & regions, including **USA 16.3%** (**63.76 kg** per cap per annum), North America 15.9% (62.22 kg), Central America 15.4% (47.7 kg), Oceania 12.4% (46.34 kg), South America 13.5% (42.14 kg), Europe 11.5% (41.75 kg) & Japan 9.3% (27.08 kg).



Concluding remarks

With increasing income there has been shift away from the traditional high-fiber staple food based diet to a Western style diet with increased consumption of cheaper processed & refined foods, animal meats, dairy produce, eggs & refined vegetable oils & sugars;

From a health perspective, it is clear that the excess consumption of these products, in combination with a more sedentary lifestyle, can have a negative effect on human health & an increased risk of coronary heart disease, stroke & diabetes;

However, as in the case of Japan, the high consumption of fish & seafood products in combination with meat products in moderation, coupled with a restricted calorie intake, can have a beneficial effect on health and longevity;



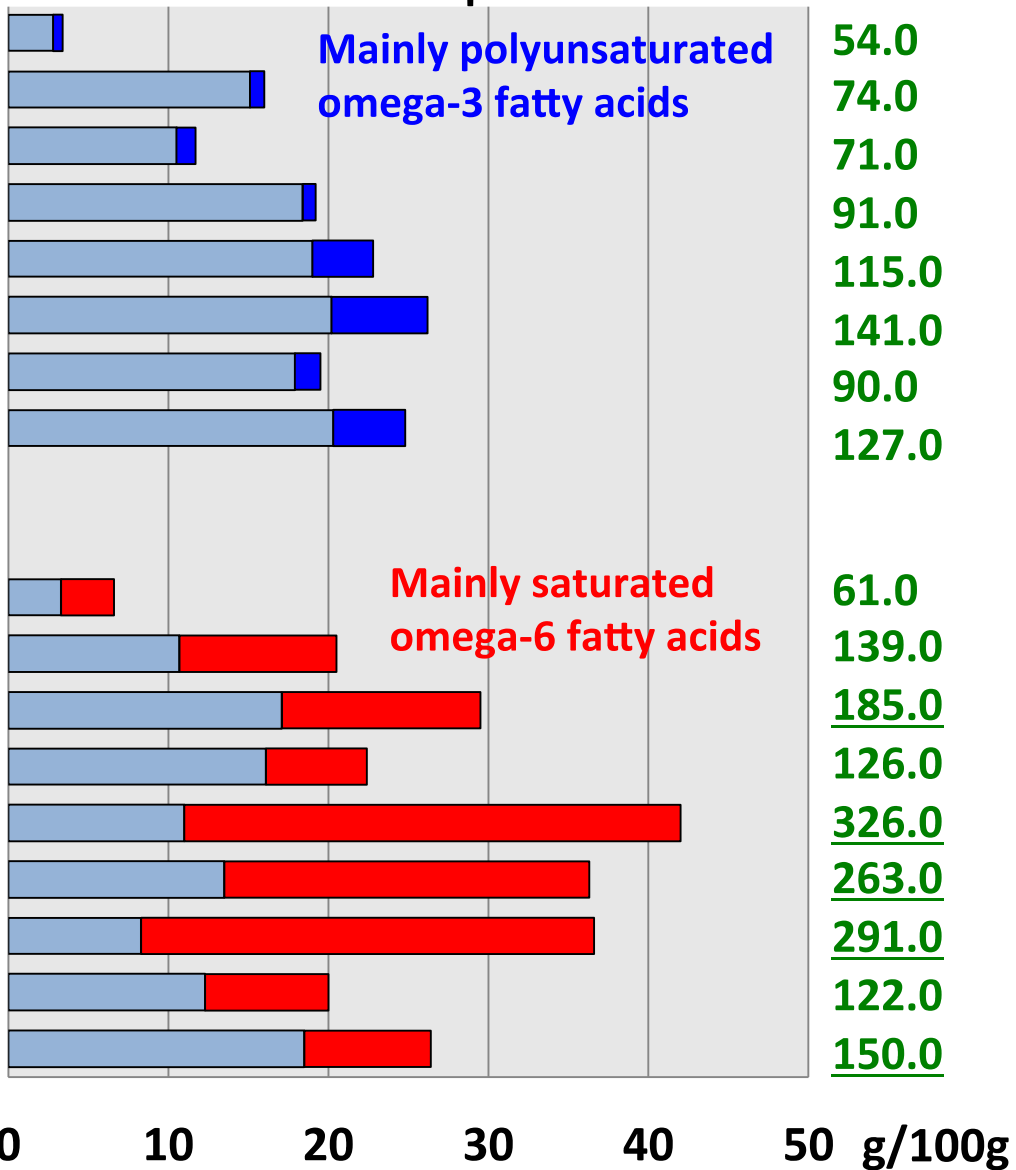
Per capita food supply in Japan, USA & Brazil in 2013

(FAO Food Balance Sheets, 2016)

	JAPAN	USA	BRAZIL	WORLD
Calories (kcal/day)	2,726	3,682 +++	3,263 ++	2,884
Animal protein (g/day)	48.46	69.78 +++	52.59	32.13
Animal fats (g/day)	33.52	67.67 +++	58.2 ++	37.55
Terrestrial meat (kg/year)	49.45	115.13 +++	97.58 ++	43.22
Fish & seafood (kg/year)	48.9 +++	21.5	10.87	19.7
Aquatic animal fat (g/day)	5.93 +++	1.35	0.55	1.18
Aquatic plants (kg/year)	0.92 +++	0	0	2.04
Fish/seafood (g protein/d)	17.5	5.08	2.88	5.22
Fish/Animal protein (%)	36.3	7.3	5.5	16.2



DIET MATTERS



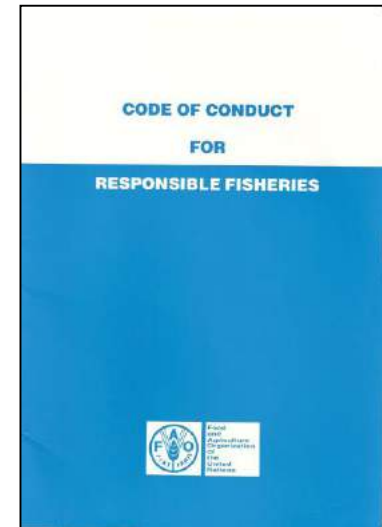
Tacon & Metain (2013)

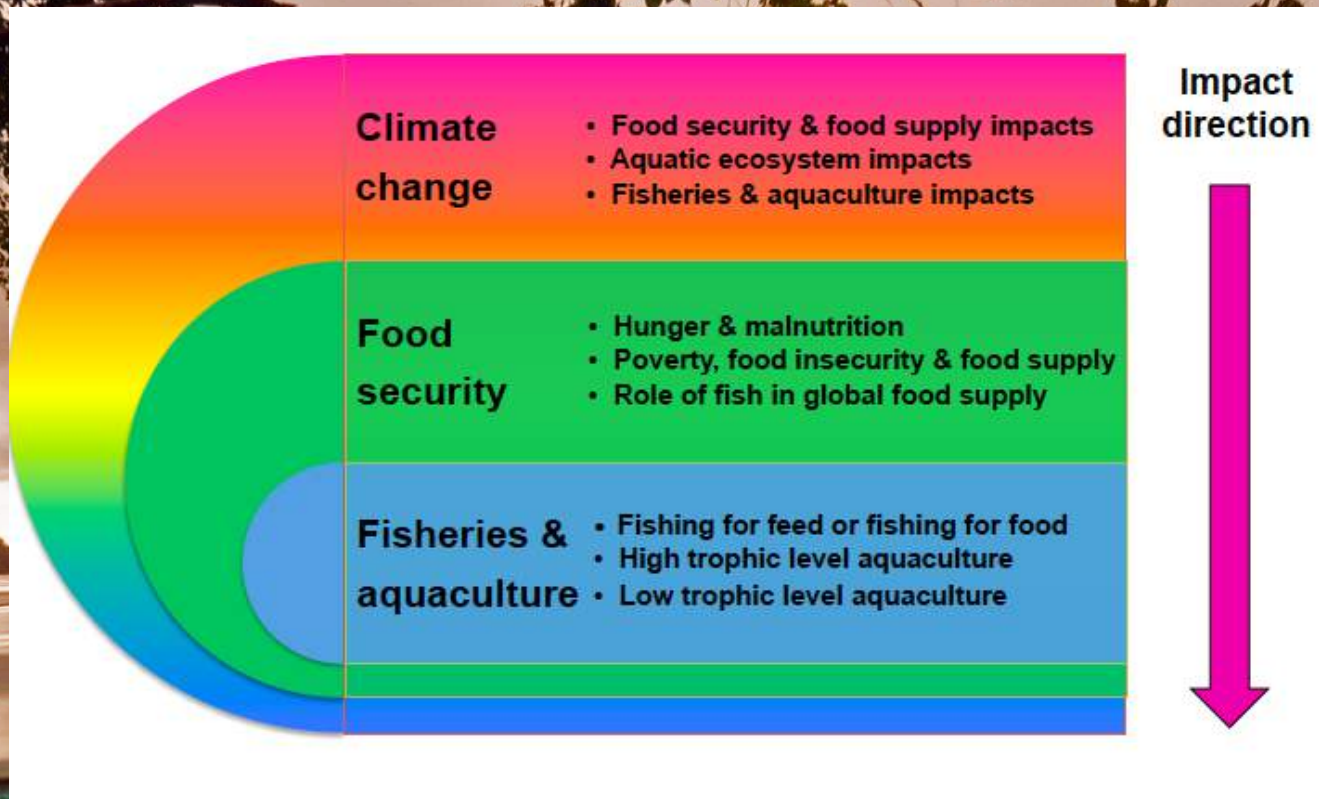


At present most aquaculture existing certification principles, standards & criteria have focused on management & development of BPs, rather than on increasing overall domestic seafood supply & availability, or addressing food security & poverty alleviation.

For example, Article 2.f CCRF states one of the major objectives of the Code as being `promote the contribution of fisheries to food security & food quality, giving priority to the nutritional needs of local communities`.

Specifically under 9.1.3 & Article 9.1.4 - `States should ensure that the livelihoods of local communities, and their access to fishing grounds, are not negatively affected by aquaculture developments`;





Life Matters: Sustaining our food supply through responsible farming practices



Next paper ?

www.aquahana.com
agjtacon@aquahana.com

