

Aquaculture in Tanzania

Status – Challenges - Outlook

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Kilimanjaro - Tanzania

17 – 21 September, 2018

The present week activities

September 17 Registration

Opening

Participants and the expert introduce themselves

General overview about the course by the expert

Introductory presentation by the expert covering:

Status of the world aquaculture

African aquaculture

Status of Tanzanian aquaculture and the rationality of its development

A special focus will be given to the constraints facing aquaculture development as presented in earlier events and discuss it with the participants in the present course

September 18 & 19 Carrying out the following field visits to:

- Fish farm(s) and hatcheries of different production scales
- Fish processing unit, if available
- Fish feed mill, if available
- Wholesale and retail fish markets, if possible

There is a possibility to suggest a visit not mentioned above as long as it could be arranged

Note: The expert will develop a fact finding sheet for each visit to be circulated to the course participants prior to the visit

The expert develops a compiled set of constraints having the field visits in consideration

The present week activities

September 20 The expert presents the constraints in a general discussion session targeting to rank such constraints in order to work on it via effective solutions.

In this session the expert is expected to bring in case studies similar to the ones in Tanzania along with possible means of addressing such constraints

September 21 Active participation of the course participants on the entire event ending by specific recommendations towards the development of aquaculture in Tanzania.

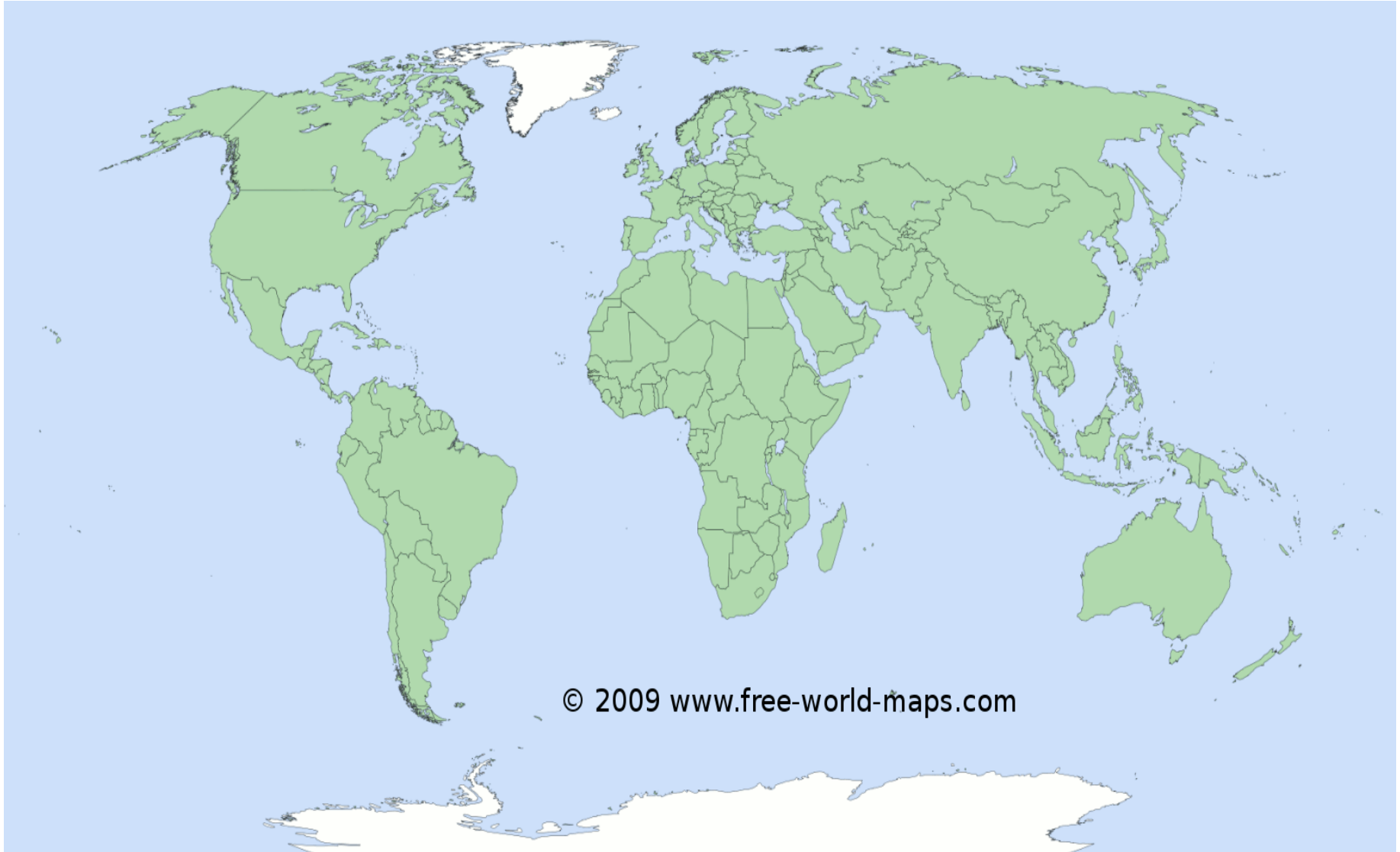
Concluding the program

Rationality of fish farming

Aquaculture has been found successful in many parts of the world in regard to:

- providing fishery products of different types and sizes as required by different social segments
- Considered an ideal approach in fish production for the growing populations in the light of the stagnation and/or fluctuation of capture fishery
- Help to reduce the pressure on the natural fishery stocks
- Fish products in general proved to be a beneficial to the health of consumers
- Creating work opportunities in different aquaculture projects
- Specific aquaculture products may be exported and so help to earn hard currency that is required by the national economy

Development of world aquaculture



World capture fishery and aquaculture

Although capture fisheries dominate world output, aquaculture accounts for a growing percentage of total fish supply, rising from a share of approximately 13 percent in 1990 to 40 percent in 2010.

As a significant part of capture fishery is used for industrial purposes (e.g. fish meal), aquaculture provides about 47 percent of all fish supplies destined for direct human food consumption.

World capture fishery and aquaculture

Worldwide, capture fisheries and aquaculture provide a source of income and livelihood for 55 million people through direct employment; overall there are more than 220 million jobs in the global fish industry.

Millions of rural dwellers – many of them women, particularly in Asia and Africa – are involved in seasonal or occasional fishing activities and have few alternative sources of income and employment.

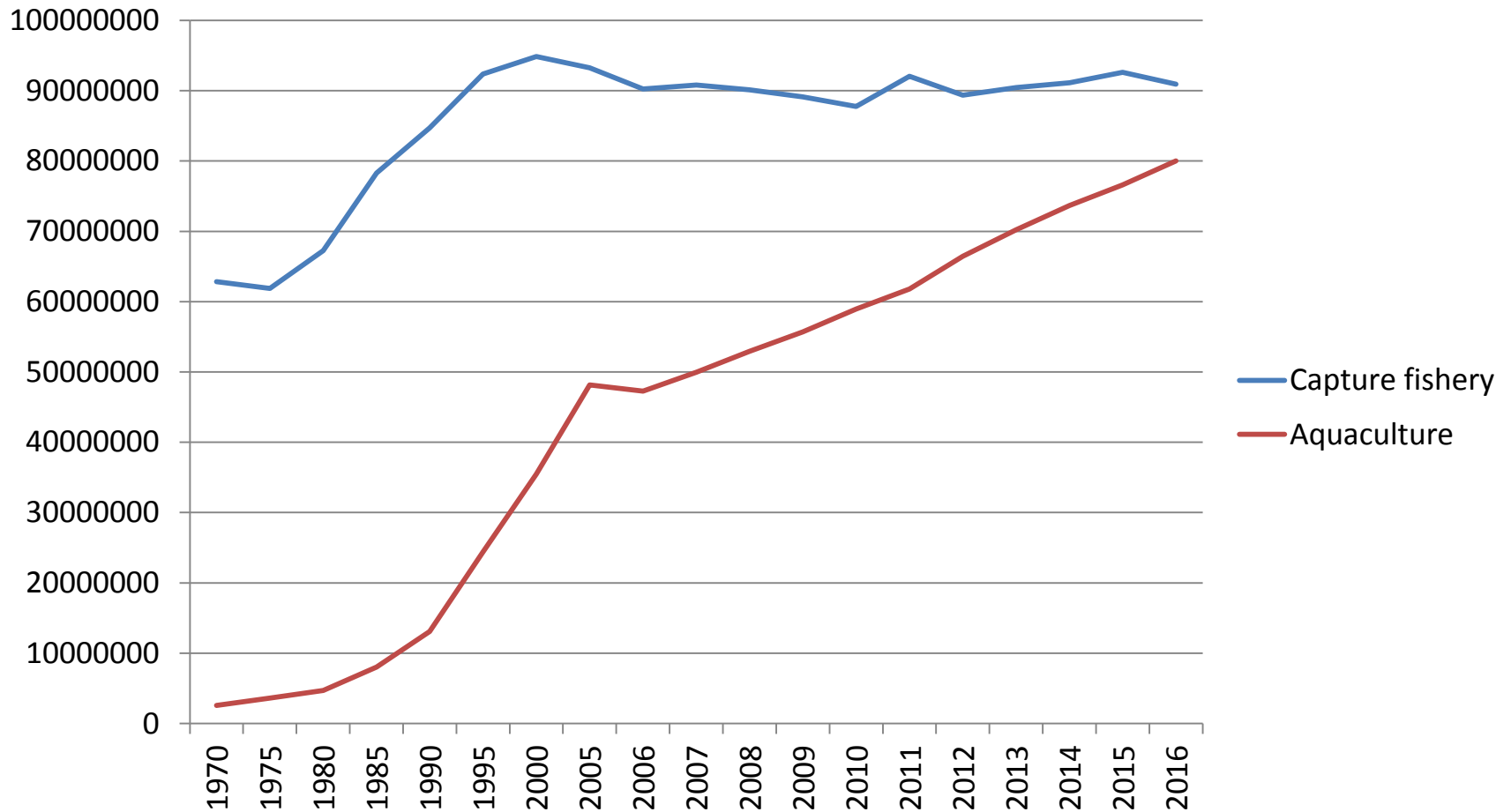
Because of the rapid development of aquaculture, the employment in aquaculture is increasing more rapidly than world population growth.

World fish production – Source: FAO

	1990	2000	2010	2015	2016
Capture fishery	84 691 996	93 562 990	87 828 719	92 670 190	90 923 551
Aquaculture	13 085 134	32 418 528	59 025 423	76 094 825	80 068 829
Total	97777130	125981518	146854142	168765015	170992380
Aquaculture: total (%)	13.38	25.73	40.19	45.10	46.83

Note: Aquatic plants (e.g. seaweed) and large aquatic mammals (e.g. whales) are excluded from the above data

Development of the world fish production (capture fishery and aquaculture) during selected years from 1970 – 2016. Source: FAO



Development of world aquaculture in different aquatic environments (2012 – 2016). Source: FAO

Environment	2012	2013	2014	2015	2016
Freshwater	41161449	43921355	45989881	47604740	50268927
Freshwater: total	(61.95%)	(62.60%)	(62.43%)	(62.59%)	(62.81%)
Brackish water	5725500	6056775	6587567	6761362	7369127
Marine water	19556074	20176356	21088985	21687599	22392808
Total (ton)	66443023	70154486	73666433	76053701	80030862

Top ten world aquaculture species in 2016

Source: FAO

Species	Ton	Species	Ton
Grass carp <i>Ctenopharyngodon idellus</i>	6068015	Whiteleg shrimp <i>Penaeus vannamei</i>	4155827
Silver carp <i>Hypophthalmichthys molitrix</i>	5300736	Bighead carp <i>Hypophthalmichthys nobilis</i>	3526812
Common carp <i>Cyprinus carpio</i>	4556622	Major Indian carp <i>Catla catla</i>	2960554
Japanese carpet shell <i>Ruditapes philippinarum</i>	4228594	Atlantic salmon <i>Salmo salar</i>	2247759
Niletilapia <i>Oreochromis niloticus</i>	4199567	Major Indian carp <i>Labeo rohita</i>	1843496

The ten species collectively produced about 49% of the world aquaculture production in 2016

World outlook

- On the world level, even aquaculture continues to grow, the rate is declining from as >10% during mid-1990s to about 4% in 2009 (FAO)
- According to FAO, aquaculture is expected to reach 95 million tons in 2020 and 123 million tons in 2030
- On the other hand, the capture fishery is expected to remain at the current production level till 2020 and 2030

African aquaculture



Introduction

According to the World Bank (2018), the African fisheries and aquaculture directly contribute \$24 billion to the African economy, representing 1.3% of the total African GDP in 2011.

The sector provides employment to over 12 million people (58% in the fishing and 42% in the processing sector). While fishing jobs are almost entirely taken by men, 59% of the processing work is done by women.

Africa fish production – Source: FAO

	1990	2000	2010	2015	2016
Capture fishery	5072241	6770808	7795149	8767151	9279133
Aquaculture	81015	399628	1285692	1771661	1981897
Total	5153256	7170436	9080841	10538812	11261030
African aquaculture: total (%)	1.57	5.57	14.15	16.81	17.60
World aquaculture: total (%)	13.38	25.73	40.19	45.10	46.83

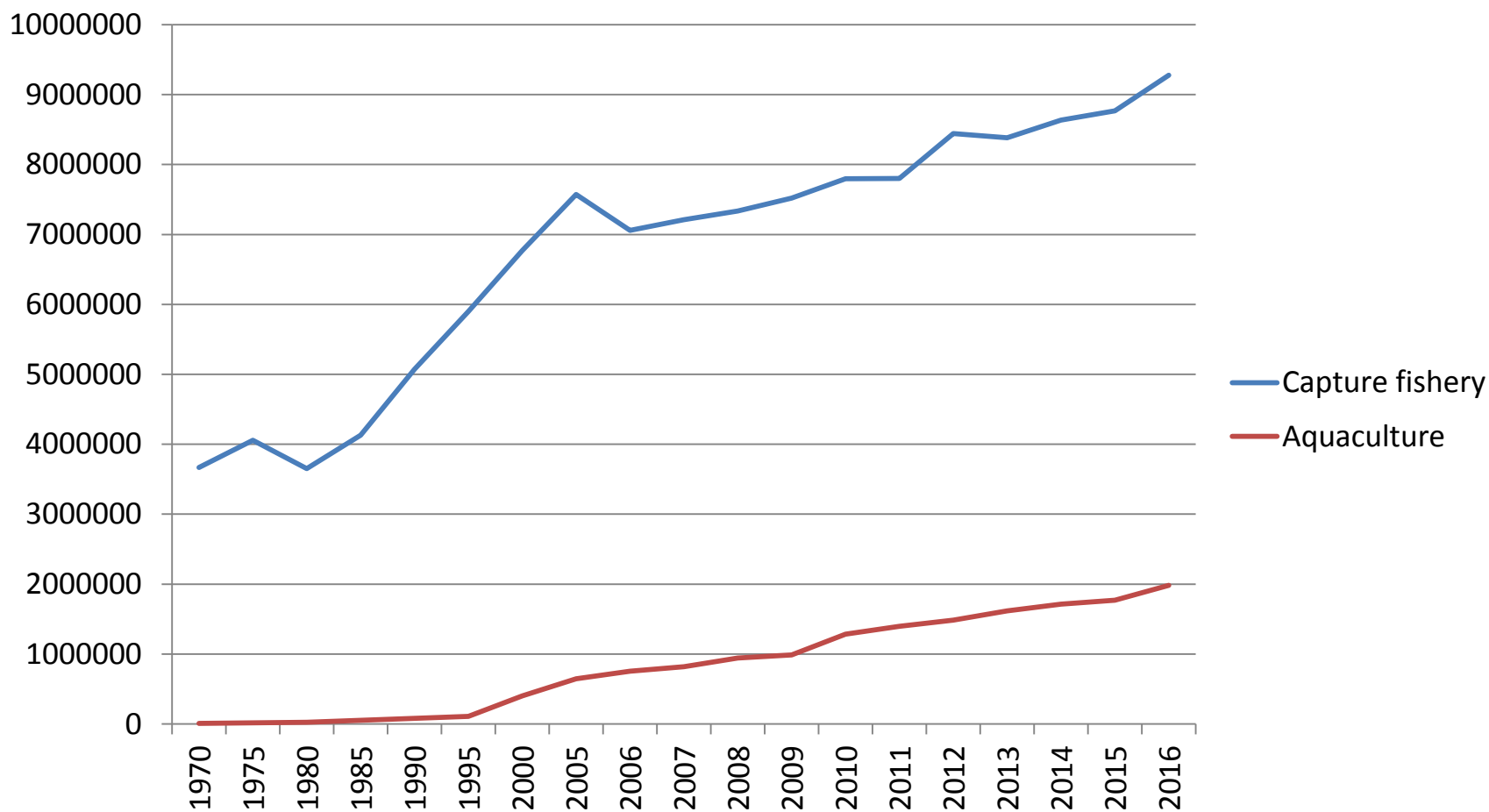
Development of African aquaculture in different aquatic environments during the period 2010 – 2016. Source: FAO

Source	2010	2011	2012	2013	2014	2015	2016
Freshwater	527081	576771	580651	733941	780459	760581	858802
Brackish water (Brackish: total)	750271 (58.36%)	809828 (58.03%)	894444 (60.27%)	871757 (53.94%)	921908 (53.83%)	1002046 (56.56%)	1112379 (56.12%)
Marine water	8340	8934	8949	10335	10115	9034	10716
Total (ton)	1285692	1395533	1484044	1616033	1712482	1771661	1981897

The significant contribution of the brackish water system in Africa is related to Egyptian aquaculture because of the freshwater use policy

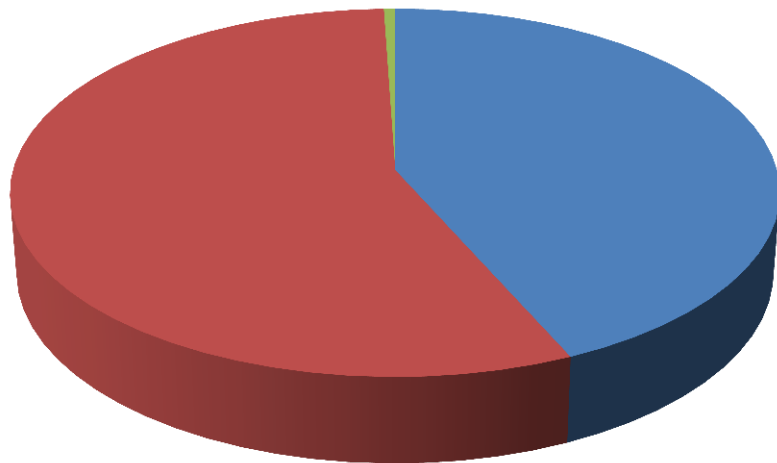
Development of African fish production (capture fishery and aquaculture) during selected years from 1970 – 2016.

Source: FAO



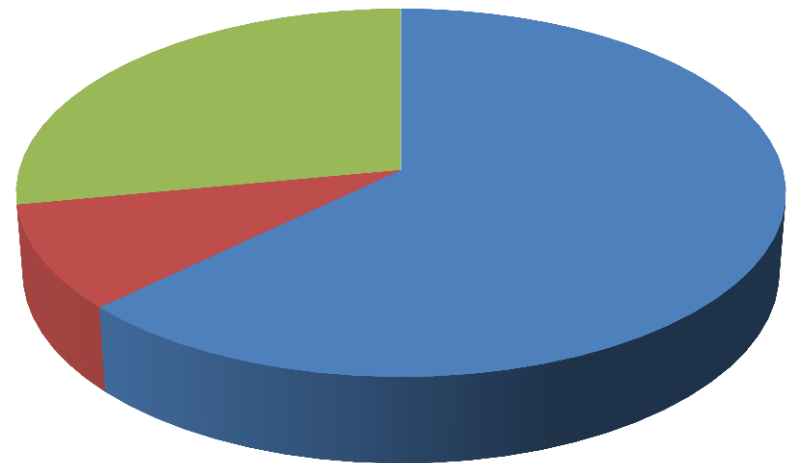
Production of African aquaculture in different aquatic environments in 2016 (ton) compared to world aquaculture

Africa



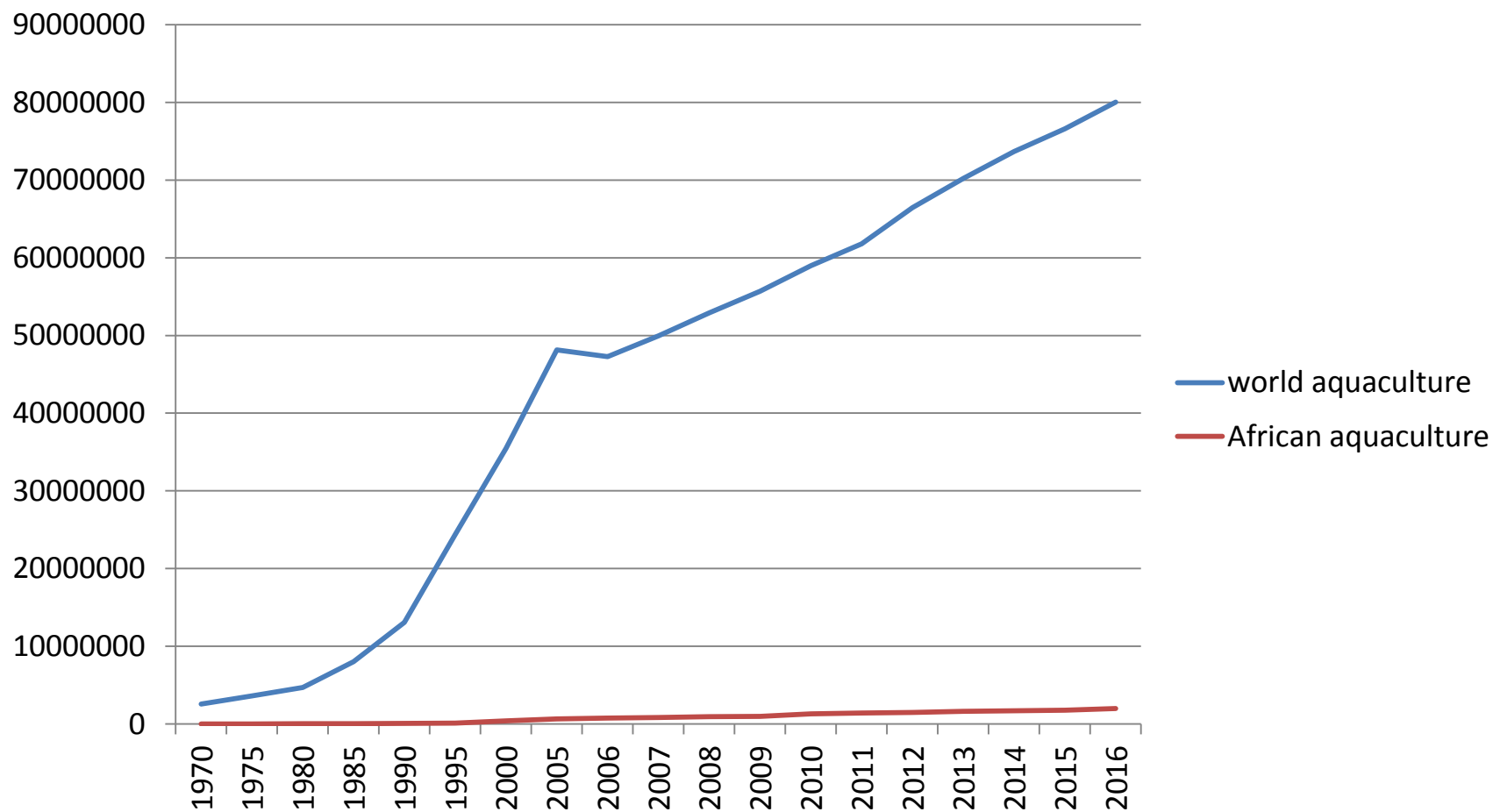
■ Freshwater ■ Brackish water ■ Marine water

World



■ Freshwater ■ Brackish water ■ Marine water

African aquaculture in comparison to world aquaculture in selected years from 1970 to 2016. Source: FAO



Main fish groups contributing to African aquaculture during the period 2010 – 2016 Source: FAO

Group of fish	2010	2011	2012	2013	2014	2015	2016
Freshwater fishes	1110126	1217465	1296141	1436925	1521819	1547356	1729250
Diadromous	1808	2212	2690	3190	3544	3525	3727
Crustaceans	5705	6977	6382	11572	12329	3732	4607
Marine fish	165018	166136	175568	160495	170320	212131	238571
Mollusks	3034	2741	3262	3894	4458	4892	5705
Miscellaneous fish products	1	1	1	1	1	25	37
Total (ton)	1285692	1395505	1484044	1616077	1712471	1771661	1981897

Species composition of freshwater aquaculture in Africa during the period 2010 – 2016.

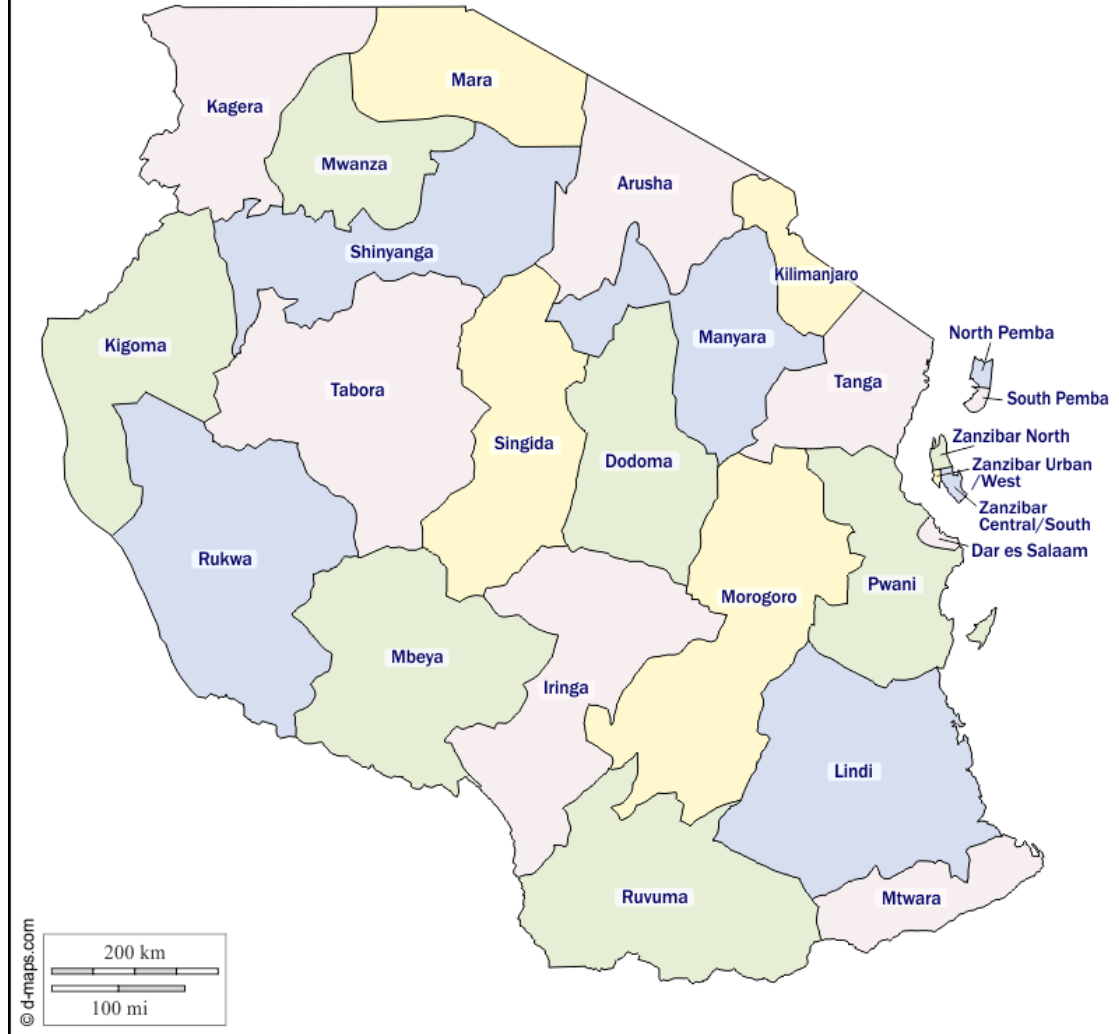
Source: FAO

Fish group	2010	2011	2012	2013	2014	2015	2016
Tilapias and cichlids	644403	718953	917595	804141	949119	1079662	1177262
Carps and cyprinds	210129	226344	95275	324388	323090	128532	236527
Miscellaneous freshwater fish	255594	272167	283271	308395	339611	339161	315461
Total (ton)	1110126	1217464	1296141	1436924	1611820	1547355	1729250
Tilapia: total (%)	58.04	58.98	70.79	55.96	55.88	69.77	68.08

African aquaculture outlook

According to the estimation by FI Department (FAO), the annual growth rate of aquaculture in Africa (2007 to 2030) is expected to be the highest with 7.2% compared to the world average 4%, Asia 4.1%, Europe 3.1%, Europe 3.1%, Latin America 4.4%, North America 0.4% and Oceania 2.6%

Aquaculture in Tanzania



Features of Tanzanian aquaculture

Aquaculture in Tanzania is still mainly practiced by small-scale farmers in extensive system in small ponds

Tanzanian aquaculture with its current 5000 ton average is composed mainly of tilapia that exceeded 75% of total aquaculture during the past 5 years. African catfish in freshwater and milkfish in marine water are following tilapia but with a large distance

Seaweed is successfully practiced in the coastal areas and mostly practiced by women

There are several emerging attempts on the farming of marine shrimp (*P. monodon*), pearl oyster, or crab fattening as well as the cage aquaculture in Lake Victoria



Polyculture trial of
milkfish and tilapia
mossambicus in Tanga
Region

Credit: Fadhili Ruzika

Features of Tanzanian aquaculture (Cont.)

Fish consumption which is estimated to be about slightly below 6 kg/capita/year, contributes by about 16.2% of the total animal protein intake and only 2.8% of total protein intake.

The present low per capita fish consumption in Tanzania is about 30% of the world average and about 52% of the same parameter in Africa

With a population growing at 2.7% annually, increased supplies of are required just to maintain the present level of consumption. Further increase in fish supply are required to enhance the fish consumption in Tanzania



Construction of communal fish ponds in Songea

Credit: Lucka Paschal and Erick Kiiza

Capture fishery and aquaculture production in Tanzania during the period 2010 – 2016.

Source: FAO

Source	2010	2011	2012	2013	2014	2015	2016
Capture fishery	350762	347927	378668	379341	340726	374451	370003
Aquaculture	454	648	3407	3477	3612	3992	5047
Total (ton)	358101	355176	388585	389507	351043	385193	382550
Aquaculture : total (%)	0.13	0.18	0.88	0.89	1.03	1.04	1.32

Main fish groups contributing to Tanzania aquaculture during the period 2010 – 2016 (in tons). Source: FAO

	2010	2011	2012	2013	2014	2015	2016
Freshwater fish	201	221	2913	2985	3007	3510	4300
Diadromous fish	16	137	224	207	214	234	400
Crustaceans	236	290	270	285	391	248	347
Total	453	648	3407	3477	3612	3992	5047
Freshwater: total (%)	44.4	34.1	85.5	85.8	83.3	87.9	85.2

Species composition of Tanzania aquaculture in tons during the period 2010 – 2016. Source: FAO

	2010	2011	2012	2013	2014	2015	2016
Nile tilapia	200	221	2913	2980	3000	3500	3800
African catfish	1	0	0	5	7	10	500
Milkfish	8	137	221	203	210	230	390
Giant tiger prawn	231	290	270	285	391	248	345
Salmons & trout	8	0	3	4	4	4	10
Crabs	5	0	0	0	0	0	2
Total	453	648	3407	3477	3612	3992	5047
Nile tilapia: total (%)	44.15	34.10	85.50	85.71	83.01	87.67	75.29

Aquaculture production in Tanzania (ton) compared to African aquaculture. Source: FAO

	2010	2011	2012	2013	2014	2015	2016
Tanzania	453	648	3407	3477	3612	3992	5047
Africa	1285692	1395505	1484044	1616077	1712471	1771661	1981897
Tanzania : Africa aquaculture (%)	0.035	0.046	0.230	0.215	0.211	0.225	0.255

Rationality for aquaculture development in Tanzania

- Present aquaculture production is far below the potential
- According to national policy documents, the fish consumption in Tanzania has fallen from 7.65 kg during 2000 – 2003 to 6.67 kg during 2004 – 2007 and then to 5.58 kg/capita/year in 2013
- In order to maintain the current level of fish consumption, fish imports take place
- All fish exports belong to the capture fishery; no exports from aquaculture
- Available natural resources, increasing fish demands, decline of capture fishery and before all the trained human resources are all in favor of a well-developed aquaculture in Tanzania

Rationality for aquaculture development in Tanzania

- The trained staff who may seem insufficient, their technical capacity could be refreshed in order to contribute to the development of aquaculture in Tanzania. In line with that, the Egyptian International Center for Agriculture (EICA) hosted 26 participants from Tanzania who received aquaculture training. As expected, more technical staff received training on aquaculture in other countries
- The existing fishery and aquaculture training centers such as the one in Mbegani can play an important role in the development process of aquaculture
- The role of the research centers in the University of Dar Es Salaam, the University of Sokoine and the Tanzanian Fisheries Research Institute (TAFIRI) would be essential in the development of Tanzanian aquaculture



Nile tilapia hatchery at
Ruhila Aquaculture
Development Center
Credit: Fadhili Ruzika

Quantity and value of imported fish in Tanzania compared to that in Africa during the period 2012 – 2016. Source: FAO

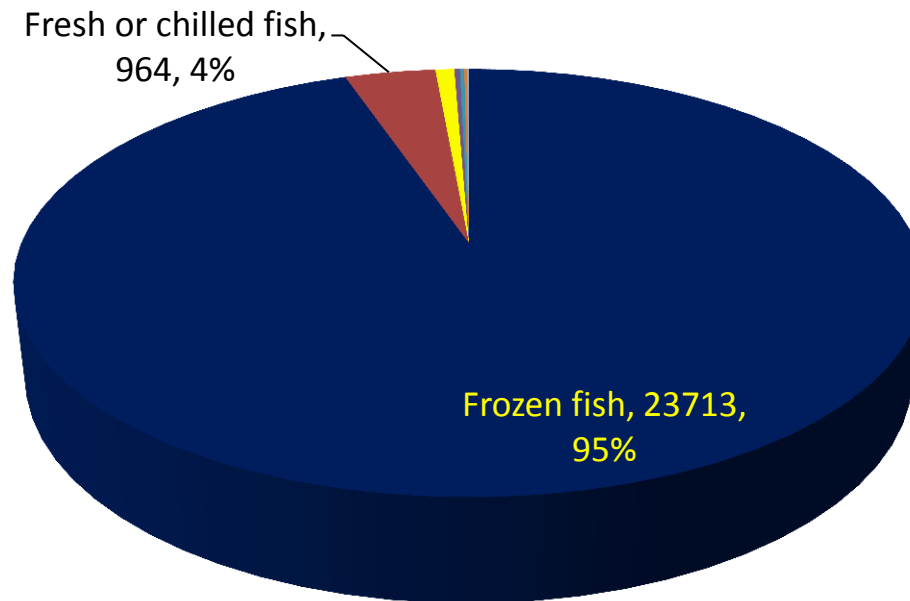
	2012	2013	2014	2015	2016
Tanzania					
Imported quantity (ton)	6419	9291	19543	19644	25033
Value 1000 US\$	6322	9447	18179	17337	21780
Africa					
Imported quantity (ton)	3456431	3380482	4026385	3893286	3715155
Value 1000 US\$	5388856	5301577	5823308	5289896	4887837

Quantity of imported fish into Tanzania in 2016 sorted into groups (in tons). Source: FAO

Group	Quantity in tons	%	Notes
Frozen fish	23713	94.73	includes 1679 t tilapia, 20855 t mackerels, 281 t sardines and 498 t tunas
Fresh or chilled fish	964	03.85	includes 961 t salmonids & 2 t tilapia
Frozen fish fillets	201	00.80	Includes 11 t tilapia
Prepared/preserved fish	58	0.23	
Dried – salted smoked fish	47	0.19	
Fish meat (fresh – chilled – frozen)	31	0.13	
Crustaceans – mollusks – other invertebrates	18	0.07	
Live fish	1		
Total	25033	100	

The imports of tilapia possibly indicates a higher demand and consumer preference of the species

Types of imported fish into Tanzania



- Frozen fish
- Fresh or chilled fish
- Frozen fish fillets
- Prepared/preserved fish
- Dried - salted or smoked fish
- Fish meat (fresh - chilled - frozen)
- Crustaceans - molluscs - aquatic invertebrates
- Live fish

Quantity and value of exported fish from Tanzania compared to that in Africa during the period 2012 – 2016. Source: FAO

	2012	2013	2014	2015	2016
Tanzania					
Exported fish (ton)	56760	49270	50139	45668	44469
Value 1000 US\$	169837	133246	167963	161718	142622
Africa					
Exported fish (ton)	2002287	2040521	2185104	2344017	2567034
Value 1000 US\$	5773359	6001287	6341303	5942900	6335492

Quantity of exported fish from Tanzania in 2016 sorted into groups (in tons). Source: FAO

Group	Quantity in tons	% Qty	US\$ 1000	% US\$	
Fresh or chilled fish	2645	5.95	1892	1.33	
Frozen fish	1415	3.18	2042	1.43	
Frozen fish fillets	6956	15.64	33146	23.24	
Fresh/chilled fish fillets/meat	3268	7.35	16990	11.91	
Frozen fish meat	10149	22.82	63501	44.52	
Crustaceans (frozen – not frozen – prepared)	1445	3.25	10931	7.66	
Dried – salted smoked fish	6391	14.37	5027	3.53	
Crustaceans – mollusks – other invertebrates	12081	27.17	8622	6.05	
Live fish	119	0.27	471	0.33	
Total (tons)	44469	100	142622	100	

Composition of consumed fish products in Tanzania. Source: FAO FISHSTAT-Food supply

	2008	2009	2010	2011	2012	2013
Total per capita fish consumption (kg/person/year)	5.09	6.1	6.27	5.94	5.74	5.58
Composition						
Freshwater fish	4.53	5.14	5.28	5.01	4.86	4.71
Demersal fish	0.26	0.54	0.47	0.56	0.54	0.53
Marine fish	0.17	0.20	0.14	0.08	0.08	0.08
Pelagic fish	0.08	0.18	0.31	0.19	0.18	0.18
Crustaceans	0.03	0.02	0.04	0.06	0.05	0.05
Mollusks	0.02	0.02	0.02	0.03	0.02	0.02
Cephalopods	0	0	0.01	0.01	0.01	0.01

Daily protein intake from non-animal protein sources in Tanzania (g/person/day). Source: FAOSTAT

Source	G	Source	G
Wheat	3.66	Onions	0.09
Rice - maize – millet	20.91	Other vegetables	1.34
Sorghum	2.04	Bananas – pineapples - plantains	1.33
Other cereals	0.09	Dates	0.01
Cassava – potatoes – sweet potatoes - yams	4.02	Oranges- mandarins – other citrus	0.14
Sugar cane	0.05	Other fruits	0.16
Beans – peas – other pulses	12.04	Coffee - tea (including mate)	0.06
Groundnuts (in shell + shelled)	6.92	Nuts - coconuts	0.40
Roots & tuber	4.03	Pimento – other spices	0.07
Tomatoes	0.21	Beverages, Fermented	0.73
Sunflower seed – soyabeans – other oil crops	0.53	Miscellaneous	0.15
Total	58.98		

Daily protein intake from animal protein sources in Tanzania (g/person/day) in 2013. Source: FAO

Sources	G
Bovine Meat	2.43
Mutton & Goat Meat	0.51
Poultry Meat	0.62
Meat, Other - pigmeat	0.32
Offals, Edible	0.63
Butter – Ghee – fats – cheese - honey	0.22
Eggs	0.16
Milk - Excluding Butter/ milk whole	5.50
Freshwater Fish	1.80
Marine Fish – pelagic fish – demersal fish- crustaceans	0.21
Total	12.40

Typical indicators on fish consumption in Tanzania in 2013 compared to those in Africa and in the world. FAO FISHSTAT-Food supply

	Per capita fish consumption (kg/year)	Daily protein intake from non-animal sources (g/person/day)	Daily protein intake from animal sources (g/person/day)	Total daily protein intake (g/person/day)	Daily fish protein intake (g/person/day)	Ratio between the daily intake of fish protein: animal protein %	Ratio between the daily intake of fish protein: total protein %
Tanzania	5.58	58.98	12.40	71.38	2.01	16.21	2.81
Africa	10.75	63.75	19.74	83.49	3.10	15.70	3.71
World	19.17	48.91	32.12	81.03	5.24	16.31	6.47

Note: The per capita protein intake is an average for the whole population. The recommended intake will vary from person to person based on age, activity level, stages of life and overall health.

The recommended daily protein intake for most people is 0.8 grams of protein for every kilogram of body weight to meet the body's basic requirements.

Production of field crops (ton) possibly related to aquaculture in Tanzania. Source: FAOSTAT

	2013	2014	2016
Millet	322731	362750	312352
Yams	10000	9976	10767
Sorghum	832084	883195	756348
Cotton seed	224000	155000	No Data
Sesame seed	1050000	1113982	940221
Maize	53563350	6737197	5875560
Sunflower seed	2625000	2755000	890000
Rice, paddy	2194750	2621034	2985581
Wheat	103973	167000	96122
Barely	11300	11400	15370
Ground nuts (with shell)	1425000	1635335	550000
Dry beans	1113541	1114500	1158039
Cassava	4755160	4992759	5575304
Dry peas	130000	145101	144321
Soybeans	5830	6025	5708

Consumed animal protein rather than fish in Tanzania – in tons (Source: FAOSTAT)

Source	2012	2013	2014	2015	2016
Cattle meat	289835	299581	309353	319112	322982
Goat meat	37200	37800	39035	41952	43231
Sheep meat	22800	25200	28589	20265	20375
Pig meat	14400	14400	14440	14526	14754
Chicken meat	84524	87408	95292	99540	102367
Duck meat	1320	1320	1324	1330	1333
Hen eggs	85553	85632	103704	105112	106701
Other eggs	1750	1750	1814	1750	1750
Cow milk (whole)	1853099	1921640	1990183	2058726	1423915
Goat milk (whole)	166915	167661	195571	206243	211782

Challenges to fisheries and aquaculture development in Tanzania

Sources of the information:

- Stakeholder meetings held in: Mwanza (December 2009), Dar es Salaam (March 2010), and Dodoma (January 2011)
- Country reports and round table discussions held during the training courses hosted by the Egyptian International Center for Agriculture (EICA) - Egypt
- Published publications addressing this subject matter

Compiled list of constraints

- The support provided to aquaculture development by research, education, training and extension services is not sufficient
- Information on fisheries and aquaculture is not adequate or not fully reliable
- The access to finance and credit facilities is often difficult
- Aquaculture inputs (e.g. feed) may not exist at affordable prices especially for small holders
- Quality of fish seeds is questionable
- Commercially-produced fish feed is not readily available.
- The on-farm mixed feed varies in quality (no standard)
- The investment in aquaculture infrastructure and facilities (processing, marketing, hatcheries and feed industry) is not sufficient.
- Financial resources allocated to aquaculture at governmental level is not sufficient
- Development of sustainable aquaculture (seed, feed and markets)
- Weak marketing channels and lack of storage facilities
- Low participation in regional and international obligations

End of this part

Brain storming session

Issues for discussion regarding the development
of aquaculture in Tanzania

Way-forward concluding session