Iran Fisheries Organization

Technical Workshop on Marine Cage Culture in the **Islamic Republic** of Iran



Tehran 26-29 September 2016







Food and Agriculture Organization of the United Nations

Good morning and welcome to you all

صبح شما بخير و خوش امديد



Excellent and growing work relation



Food and Agriculture Organization of the

Self presentation



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F PANT

http://www.fao.org/fishery/en



- <u>3 days technical presentations</u>
 - 10 technical presentations
 - (national and international experts)



- Morning & afternoon sessions (coffee breaks)
- Question & Answers
- <u>1 day field trip Mazandaran sea cages</u>



I have been invited by the organizers to <u>co-chairperson</u> this technical workshop. I hope to do a good job.





I have been asked to give a two hours presentation

I do NOT want to:

Bore you! Make you fall a sleep!



..... so please

interrupt and ask questions **ANYTIME**



A few slides to set the scene

A rapid glance to the aquaculture sector TODAY:

Global fishery and aquaculture value chain = \$1 trillion; 57 million jobs; livelihoods of < 12% global population





Food and Agriculture Organization of the

These are the STATISTICS TODAY: Aquaculture produces half of all fish and shellfish eaten



- Growth in supplies during the 1960s and 70s fisheries.
- Since the 1980s it has been due to **aquaculture**.
- With nearly 90% of fish stocks fully or overfished, future growth in fish supplies must continue to come from aquaculture.



Can FISHERIES supply more?

THE MESSAGE IS: Maximum sustainable potential from wild capture fisheries in the oceans has been reached!

1997-98

1948-49



Dramatic biomass decline



A few slides on aquaculture STATS

World aquaculture production of finfish, crustaceans, molluscs and other aquatic species in 2012 from inland aquaculture and mariculture

	Inland aquaculture	Mariculture	SUB-TOTAL	
	(thousand tonnes)	(thousand tonnes)	(thousand tonnes)	(percent)
Finfish	38 599	5 552	44 151	66.3
Crustacean	2 530	3 917	6 447	9.7
Molluscs	287	14 884	15 171	22.8
Other species	530	335	865	1.3
TOTAL	41 946	24 687	66 633	100

Total World Aquaculture 2012:

- 66.6 mill. mt food fish
- 23.78 mill. mt aquatic algae
- 22.4 mill. mt non food products (mainly pearls and

90.43 million tonnes

(food for human consumption)(mainly marine macroalgae)(mainly pearls and shells, etc.)



Aquaculture contribution = to the world total fish production (2012)

42.2 % (up from 25.7 %in 2000)

Asia the only continent producing more fish than capture fisheries

(54 %)

Aquaculture share in total fish production rose all other continents

Europe at 18 % Others <15 %

On global average, aquaculture supplied **9.41** kg of food fish per person

CONSUMPTION



Organization of the





DESERTIFICATION



Desertification affects about 2/3 of the countries of the world, and 1/3 of the earth's surface, on which 1 billion people live (1/5 of the world population)







Cities worldwide are growing fast with much of the world population living along the coastal belt







Increase use competition of coastal land by different users (e.g. urban development, industry, recreation, transport)







The global human population is growing, growing fast!! Over 9 billion by 2050



Inland Aquaculture Vs Mariculture

A rapid glance to the aquaculture sector today:

World production of food fish from inland aquaculture and mariculture by continent

		1990	1995	2000	2005	2010	2012
Africa	Inland aquaculture	77 279	102 703	391 581	632 001	1 273 503	1 467 749
$ \longrightarrow $	Mariculture	3 736	7 589	8 107	14 181	13 088	17 618
	Africa total	81 015	110 292	399 688	646 182	1 286 591	1 485 367
America	Inland aquaculture	300 536	398 112	609 909	748 545	977 923	1 177 439
$ \longrightarrow $	Mariculture	247 943	521 459	813 524	1 428 195	1 603 166	2 009 881
	America total	548 479	919 571	1 423 433	2 176 740	2 581 089	3 187 319
Asia	Inland aquaculture	6 574 192	12 650 165	17 321 975	24 278 467	34 065 242	38 835 173
	Mariculture	4 227 464	9 027 349	11 100 514	14 909 386	18 374 898	20 064 895
	Asia total	10 801 656	21 677 514	28 422 489	39 187 853	52 440 140	58 900 068
Europe	Inland aquaculture	711 245	445 512	454 849	460 048	466 615	461 095
	Mariculture	890 279	1 135 395	1 595 840	1 674 856	2 077 363	2 415 213
	Europe total	1 601 524	1 580 907	2 050 689	2 134 904	2 543 978	2 876 309
Oceania	Inland aquaculture	1 781	2 692	3 808	1 800	3 660	4 309
$ \longrightarrow $	Mariculture	40 224	91 546	117 674	149 666	181 957	179 882
	Oceania total	42 005	94 238	121 482	151 466	185 617	184 191
WORLD		13 074 679	24 382 522	32 417 781	44 297 145	59 037 416	66 633 253
						(I)	





This is the **BLUE** planet



The OCEANS: 72% of the Earth's surface.

Healthy ocean ecosystems are vital to human welfare.

The 21st century challenge faced is: **feeding a rapidly growing population**.

<u>9</u>+ billion by 2050





..... what is our FUTURE?







..... what is our FUTURE?



HUNGER INCREASE?

C-





..... what is our FUTURE?



Where do we stand TODAY



FOOD ິ FISH ECORD

ازمان سلات ايران

Food and Agriculture Organization of the

United Nations

Fish demand (population growth only)



Fish Demand (mt)	2007 (baseline)	2030 (projection)	
Africa	9.0	14.0	
Asia	86.4	96.3	
Europe	19.4	19.9	
L.A. & C.	15.2	16.4	
Northern America	9.1	10.7	
Oceania	1.1	1.4	
World	140.3	158.8	
Source: Estimation of FAO/FI Department			

- To maintain baseline consumption in every country, ≈159 million tonnes of fish needed to feed world population in 2030.
- Total supply (211 mt) > Total demand (159 mt)





Demand (population & income growth)



Fish Demand (mt)	2007 (baseline)	2030 (projection)
Africa	9.0	18.7
Asia	86.4	186.3
Europe	19.4	23.4
L.A. & C.	15.2	18.3
Northern America	9.1	12.9
Oceania	1.1	1.8
World	140.3	261.2
Source: Estimation of FAO/FI Department		





Fish supply-demand gaps

S-D gap (mt)	Supply 2030	Demand 2030	S-D gap 2030
Africa	11.7	18.7	-7.0
Asia	156.5	186.3	-29.8
Europe	18.6	23.4	-4.8
L.A. & C.	16.2	18.3	-2.1
Northern A.	6.2	12.9	-6.6
Oceania	1.5	1.8	-0.3
World	210.7	261.2	-50.6

Source: Estimation of FI Department

- Per capita fish demand in 2030 estimated based on assumptions:
 - GDP per capita projection by IMF
 - Prices unchanged
 - Preference unchanged
- Total fish demand in 2030 estimated based on:
 - Estimated per capita demand in 2030.
 - UN population projection in 2030.
 - Non-food fish demand unchanged

Results:

- Supply < Demand</p>
 - 51 mt shortage
- S-D gaps decline in all regions
 - Largest insufficiency in Asia



Food and Agriculture Organization of the

Aquaculture growth rate is declining!





Bridging the supply-demand gaps

Aquaculture growth rate during 2007-2030	Expected APR (%)	Required APR (%)
World	4.0	5.6
Africa	7.2	11.5
Asia	4.0	5.3
Europe	3.1	4.0
L.A. & C.	4.4	7.6
Northern America	0.4	9.0
Oceania	2.6	7.9

 If countries aquaculture production follow the recent trend, expected aquaculture growth rate:

- 4.0 percent annually

- To feed growing and wealthier world population, required aquaculture growth rate:
 - 5.6 percent annually

è Insufficiency



Source: Estimation of FAO/FI Department

Where do we stand TODAY



≥ 0 ANS?? Ш





Bridge the supply-demand from







Finfish aquaculture, especially <u>inland aquaculture</u> of <u>herbivorous</u> and <u>omnivorous</u> finfish species, is the most important sub-sector of aquaculture production in volume terms. It is the source of affordable quality protein food in many developing countries.

Geographically **tilapias** are the most wide spread species for aquaculture production in the world.







The publication launched in China a couple of years ago

Focus on projections for the years 2013-2022









Fish farms to produce nearly two thirds of global food fish supply by 2030

Fish to 2030: Prospects for Fisheries and Aquaculture



The rise in seafood demand gives countries the opportunity to expand and improve responsible fish and shellfish farming practices.







http://www.fao.org/docrep/019/i3640e/i3640e.pdf

AGRICULTURE AND ENVIRONMENTAL SERVICES DISCUSSION PAPER 33

83177

FISH TO 2030 Prospects for Fisheries and Aquaculture

WORLD BANK REPORT NUMBER 83177-GLB



World Bank's Director of Agriculture and Environmental Services, **Juergen Voegele**

- report provides valuable information for developing countries interested in growing their economies through sustainable fish production

- policies are needed to ensure the resource is sustainably managed.

"Supplying fish sustainably producing it without depleting productive natural resources and without damaging the precious aquatic environment — is a huge challenge"





HE WORLD BANK

DECEMBER 2013

SO WHAT ARE THE CHALLENGES? Many CHALLENGES!!!

- Land and water
- Cost and energy efficient productivity
- Ecosystem impacts
- Feeds: fishmeal and fish oil
- Technology and knowledge
- Biosecurity and health
- Finance and investment
- Conducive policy





Mariculture potential

What does the present status of mariculture indicates in terms of its future potential

- Coastal areas are largely unused for mariculture
- 44% of maritime nations and territories are not yet practicing mariculture
- 0.3 million km of coastline along which mariculture is not yet practiced
- About 1/3 of inshore mariculture production is plants, but there is as yet little attention to the production of plants (or fish or shellfish) offshore
- Of (93) countries and territories already practicing mariculture, 51% produce less than 1 mt/km of coastline
- These observations suggest that not only is there potential for the development of mariculture further offshore, but also of mariculture in general







<u>cost</u>

MUST BE ATTRACTIVE!!



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TECHNOLOGY

Cage models



Different cage models exists and several factors determine the choice:



Site characteristics (exposure, depth, human interaction)
Cost of cages, mooring system and installation

Production plans



Organization of th



- HDPE pipes, double or triple ring
- floating or submersible
- versatility of the materials
- simple to change the net
- frequent visual check of the fish
- relatively cost effective
- complicated mooring system
- the submersible system is not automatic
- constant weather forecast check is needed



TECHNOLOGY

- Floating steel structure
- one mooring line
- large rearing volumes
- excellent logistic
- possibility of feeding with any sea condition
- constant visual check of the fish
- durable structure (?)
- high initial investment cost
- deep for divers
- high maintenance costs
- difficult to change the nets



Submersible steel structure

•

- large rearing volumes
- Well tested under a variety of conditions
- suitable for exposed sites
- integrated feeding system
- stable holding volume
- high capital costs
- complicated access when harvesting
- net changing difficult
- high maintenance



- Artisanal cages
- floating
- cheap
- versatility of the materials
- simple to change the net
- cost effective
- CBA (e.g. groupers in Southeast Asia)
- not suitable for exposed sites
- small-scale only

TECHNOLOGY

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Assemblage et installation de cages hexagonales en bois pour l'élevage de poissons un masuel technique DOCUMENT TECHNIQUE SUR LPS PECHES

nique

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE Indian Schwol of Addictifium Addicti Karwar Research Centre UTTAR Kannada - SSI 301 Karnataka

HANDBOOK ON OPEN SEA

CAGE CULTURE

ل) سازمان شلات اتران Tran Fisheries Örganlauton

Food and Agriculture Organization of the United Nations

http://www.fao.org/docrep/018/i3091e/i3091e00.htm (also in French)





WORKING BOATS



- 1 Main work boat
- 2 Feeding boat
- **3** Auxiliary service boat









LAND FACILITIES



- A packaging / processing area
- 2 A feed warehouse (or a silos storage system)
- Area where the nets are stored and maintenance is carried out
- 4 Offices and laboratory

Distance from shore is a factor





Choice based on:

THE FARM SITE





The technology factors

To avoid all sorts of negative impacts to the farming activity itself (human or natural) and as a result of the farming activity itself (impact on the environment)

The social factors

Visual alteration on scenic places, organic matter discharge, farmed fish escapes and interaction with the local species





THE FARM SITE

Relative to the farmed species	Relative to the farming structure	Relative to the environment (protection)	Logistical, political and social aspects	
Temperature	Wind speed	Current speed	Coastal activities	
Dissolved oxygen	Current speed	Bathymetry	Land-based logistics	
Salinity	Wave height	Sea bottom type	Access to the sites	
Current speed	Bathymetry	Fauna and flora	Markets	
Organic load	Sea bottom type	Cultured biomass		
Primary production	Fouling	Dissolved oxygen		
Pathogens	Coastal activities			
Pollution				





Mindanao, Philippines



THE FARM SITE

ATTENTION!! Carrying capacity of a site Rightly a HOT topic!!! Long-term sustainability



WHAT SPECIES?

Important biological factors:

- A robust fish with an elevated *resistance to stress* (e.g. handling)
- A fish that can be *easily reproduced* in captivity and in large numbers
- A fish that grows fast and converts feed efficiently
- A fish that is not highly vulnerable to external <u>diseases</u>
- A fish that can grow to market size in confined enclosures (the cage volume)

Important socio-economical factors:

- A fish that has a <u>market demand (local and/or international)</u>
- A fish that can be produced economically and competitively
- A fish that has a good flesh yield (product differentiation / processing)





E.g. Italy





Cobia ü Meagre ü



- Artificial propagation
- Fast growing / sturdy
- Good meat yield
- Market acceptance
- Attractive for processing











Groupers? Bluefin tuna?



 Market good
 Artificial reproduction??











Feed: fishmeal and fish oil use

Fish meal content in aquafeed for different cultured species 60% 50% 40% 30% 20% 10% 0% 595 596 591 598 599 700 701 701 702 704 705 706 701 700 Freshwater finfish — Diadromous finfish Marine finfish -----Crustacean





Feed: fishmeal and fish oil use







Feed: fishmeal and fish oil use







More non-fed fish for future?







For info: SOFIA 2012

The State of World Fisheries and Aquaculture 2012 (SOFIA 2012)

P A R T 3 HIGHLIGHTS OF SPECIAL STUDIES

Demand and supply of aquafeed and feed ingredients for farmed fish and crustaceans: trends and future prospects

The conclusion of the study suggests that: "..... the sustainability of the aquaculture sector is more likely to be closely linked to the sustained supply of terrestrial animal and plant proteins, oils and carbohydrate sources for aquafeeds."

http://www.fao.org/docrep/016/i2727e/i2727e00.htm





POLICY is it conducive?

- Water space is there a coastal development plan? Does this plan takes into account aquaculture as a rightful user?
- Zone allocation the best sites for aquaculture have been identified / allocated?
- Concession / licensing Do procedures exist, are they clear and comprehensible, well coordinated and permits obtainable in a reasonable time? One-stop-shop!



POLICY is it conducive?

- Documents type and details required must be clear (EIA)? Efficient information exchange between the authorities and entrepreneurs
- Lead agency personnel with the necessary technical knowledge?



Technology: FAO outputs

Arabic, Chinese, French, Russian Spanish





E

COFI/AQ/V/2010/7

May 2010

منظمة الأغذية والزراعة اللاصم المتصدة	联合国 粮食及 农业组织	Food and Agriculture Organization of the United Nations	Organisation des Nations Unies pour l'alimentation et l'agriculture	Продовольственная и сельскохозяйственная организация Объединенных Наций	Organización de las Naciones Unidas para la Agricultura y la Alimentación
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COMMITTEE ON FISHERIES

SUB-COMMITTEE ON AQUACULTURE

Fifth Session

Phuket, Thailand, 27 September – 1 October 2010

MOVING AQUACULTURE FURTHER OFFSHORE: GOVERNANCE ISSUES AND CHALLENGES





FAO Offshore Initiative

FAO FISHERIES AND AQUACULTURE PROCEEDINGS

Expanding mariculture further offshore

Technical, environmental, spatial and governance challenges

FAO International Technical Workshop 22–25 March 2010 Orbetello, Italy





- •Sustainable development of marine aquaculture off-the-coast and offshore – a review of environmental and ecosystem issues and future needs
- •The development of offshore aquaculture: an economic perspective
- •Governance in marine aquaculture: the legal dimension
- •Two industry case studies:
- 1. Kona Blue Water Farms. Hawaii, USA
- 2. Salmon Farming, Southern Chile





AquaNor 2012



Financing and investment

• Aquaculture is primarily a private sector driven industry

Critical action areas

 Increasing efforts in moving aquaculture further offshore, including further research and adoption of new off-shore aquaculture technology.





AquaNor 2012



Conducive POLICY ENVIRONMENT

- All this will only be possible if a conducive policy environment is created at national level
- We need a concerted effort towards developing conducive national policy environments in countries with aquaculture potential
- Strong political will is the key!





Food and Agriculture Organization of the



















World's first offshore fish farm rig

22 Jun 2016

Ocean Farming AS has awarded a contract to Rolls-Royce for the construction and delivery of an eight point mooring system to the world's first offshore fish farm installation.

Ocean Farming AS is a subsidiary of the SalMar Group in Norway, one of the world's largest and most efficient producers of farmed salmon.

The equipment will be used to secure the installation to the seabed at Frohavet, off the coast of central Norway. The 68m high rig will have a diameter of 110m and a volume of 250,000m³. The eight point mooring system to be delivered by Rolls-Royce includes monitoring, fairleads, connectors and subsea load sensing system.



Rolls-Royce will construct and deliver an eight point mooring system to the world's first offshore fish farm installation: Credit: SalMar/Ocean Farming



More & more FOCUSED EVENTS!!!



At OMC 2012 in Turkey a Statement was adopted



17-19 October | Hilton Hotel | Izmir | Turkey

www.offshoremariculture.com



- At OMC 2012 in Turkey a Statement was adopted.
- Requested FAO to look into open ocean mariculture and make recommendations as to how to better encourage work towards mariculture in waters beyond any one nation's.
- Statement will be presented at the Global Oceans Action Summit for Food Security and Blue Growth.







Key Objectives

GLOBAL OCEANS ACTION SUMMIT FOR FOOD SECURITY AND BLUE GROWTH 22 to 25 APRIL, 2014 THE HAGUE, THE NETHERLANDS

http://www.globaloceansactionsummit.com/



The Summit will highlight the need to address the next frontier of successful integrated approaches that attract <u>public-private</u> <u>partners</u>, <u>secure financing</u> and <u>catalyze good ocean governance</u> while reconciling tensions and balancing priorities between:

(i) growth and conservation

(ii) private sector interests and equitable benefits for communities

(iii) EEZs and ABNJ policy frameworks



ABOUT:



Food and Agriculture Organization of the United Nations

What is the FAO?? What do we do??

How can we help??

Fisheries and Aquaculture Department

http://www.fao.org/fishery/en



Fisheries and Aquaculture Department - HOMEPAGE

FAO Home > Fisheries & Aquaculture



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for a world without hunger





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Aquaculture

for a world without hunger

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Aquaculture, probably the fastest growing food-producing sector, now accounts for nearly 50 percent of the world's food fish. The need to exchange reliable information on all related subjects is becoming a key issue for the responsible management of aquaculture. In order to provide easily-accessible and up-to-date information, the FAO Fisheries and Aquaculture Department has developed specific pages on aquaculture where users can consult relevant material on aquaculture at international, regional and national level.

Highlights

- FAO's role in aquaculture
- Aquaculture Feed and Fertilizer Resources Information System (AFFRIS)
- Global Aquaculture Production Statistics Database Updated to 2013
- FAO Aquaculture Information Products
- The Global Synthesis of aquaculture development status and trends, and
- six Regional Reviews of aquaculture development, status and trends.

www.fao.org/fishery/regional-aquaculture-reviews

Related information

more»

ets

OK

FAO Term Portal -Aquaculture

NASO aquaculture maps collection

FAO Aquaculture Photo Library

FAO Aquaculture Newsletters

GISFish - The Global Gateway to Geographic Information Systems (GIS), Remote Sensing and Mapping for Fisheries and Aquaculture

Aquaculture selected links

Fishery and Aquaculture Country Profiles - fact sheets

Session of the COFI Sub-Committee on Aquaculture

CD-ROM - Simple Methods for Aquaculture - Version 2

News



Database on Introductions of Aquatic Species (DIAS) - fact sheets

crustaceans and marine species.

FAO ... Easy off-line

2015 issue of

A SPACE AND A SPACE

issue of

FAO ...

access to FAO aquaculture .

Meetings

CACFish - Central Asian and

RECOFI - Working Group on Aquaculture ...

Reducing Feed Conversion Ratios in the


Search Aquaculture Fact Sheets National Aquaculture Sector Overview (NASO) 107 NASO Fact Sheets are available



http://www.fao.org/fishery/countrysector/naso_iran/en



Food and Agriculture Organization of the United Nations FAO Home > Fisheries & Aquaculture







Search Aquaculture Fact Sheets Cultured Aquatic Species

70 Cultured Aquatic Species Fact Sheets are available









Identity

Lates calcarifer Bloch, 1790 [Centropomidae]

FAO Names: En - Barramundi(=Giant seaperch), Fr - Perche barramundi, Es - Perca gigante





1. Introduction

2. Site selection

Site selection criteria

Environmental criteria for organisms Environmental factors on farm structures Other criteria

Nautical charts

Geographical coordinates

3. Mooring and grid system installation

Navigational buoys

Technical characteristics Material assembly on land Deployment

Grid system and mooring system Farm footprint Mooring and grid components Mooring system installation

4. HDPE cage components

HDPE cage characteristics HDPE pipes Brackets Sinkers and sinker tube

Collar construction

Collar assembly Collar installation Net installation

5. Fibres, netting and ropes

Fibres

Density Polyamide (PA), or nylon Polyester (PES) Polypropylene (PP) High-performance polyethylene (HPPE)





FISHERIES AND AQUACULTURE TECHNICAL PAPER 593

Aquaculture operations in floating HDPE cages

A field handbook



http://www.fao.org/3/a-i4508e.pdf











A message from the last OMC 2012 chairman:

"I wish attendees at the Offshore Mariculture Conference 2014 all the best in your deliberations, and in moving forward the agenda that was outlined in Izmir. I look forward to continuing to advance the legal, technological and biological framework for the Blue Revolution, beyond the Blue Horizon."



Neil Anthony SIMS Kampachi Farms, LLC Kona, Hawaii (USA) La Paz, Mexico









Iran Fisheries Organization

Technical Workshop on Marine Cage Culture in the Islamic Republic of Iran

Tehran 26-29 September 2016

Thank you! متشکرم

Two testimonial repeated from participants attending this kind of event:

- A very good opportunity for networking
- A valuable opportunity for up to date information

