



Welcome

Aquaculture Production of Tilapia in Bangladesh and its Role in the National Food Security Program



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Overview of Presentation

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Cage culture of tilapia

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Introduction:

- ❑ Bangladesh is a small/tiny country compared to its land area but stood 4th in inland fish production all over the world where contribution of tilapia is also significant
- ❑ Riverine delta rich in water resources, more water resources per capita
- ❑ Production of tilapia, the fish for future is increasing significantly
- ❑ Tilapia as hardy, fast growing, short term, suits in freshwater to brackish, smaller to larger waterbodies, cope with different culture patterns, taste with no muscular bone becoming popular day by day
- ❑ In 2012-13 228,450 metric ton tilapia produced in the country which is 8.1% and 12.28% to the total inland and culture fish production respectively
- ❑ In 2002-03 only 10,712 metric ton tilapia produced in the country, the production of tilapia in 2012-13 is about 21 times than that of 2002-03

Introduction (contd.):

- Started to export, in 2013-14 exported 333 metric ton , Bangladesh can be an important frozen tilapia fillets exporting country
- Tilapia will play important role in producing 4.552 million metric ton fish in the vision 2020-21
- Comparative low investment culture practice with affordable price for the poor can meet up animal protein demand
- Vital role to national and household level people in terms of food security, employment and income generation
- GoB in the vision 2020-21 targeted to reduce the 65 million hard core poor people to 22 million where fisheries sector as well as tilapia can be significant

Inland aquatic resources of Bangladesh with fish production scenario:

- The inland closed water and open water comprises about 16.65% and 83.35% of total inland waters respectively (FRSS, DoF, 2014)
- Closed waters, especially ponds, minor aquaculture farms, ditches, polders and brackish water farms are increasing which are potential for Tilapia culture
- Among the open waters some rivers and floodplains are suitable for cage and pen culture of Tilapia.

Fish production scenario along with tilapia in 2002-03

Water types		2002-03		Remarks
		Area (ha)	Produc(mt)	
Inland openwaters	Rivers & estuaries	1,031,563	151,732	
	Beels & haors	114,161	75,460	
	Kaptai lake	68,800	7,025	Tilapia 334 mt
	Flood land	2,832,792	475,116	
Capture total		4,047,316	709,333	
Closed water	Ponds & ditches	290,500	752,054	Tila. 10378 mt
	Oxbow lake	5,488	4,098	
	Coastal shrimp & fish farm	141,353	100,804	
Culture total		437,341	856,956	
Inland total		4,484,657	1,566,289	Tila. 10712 mt

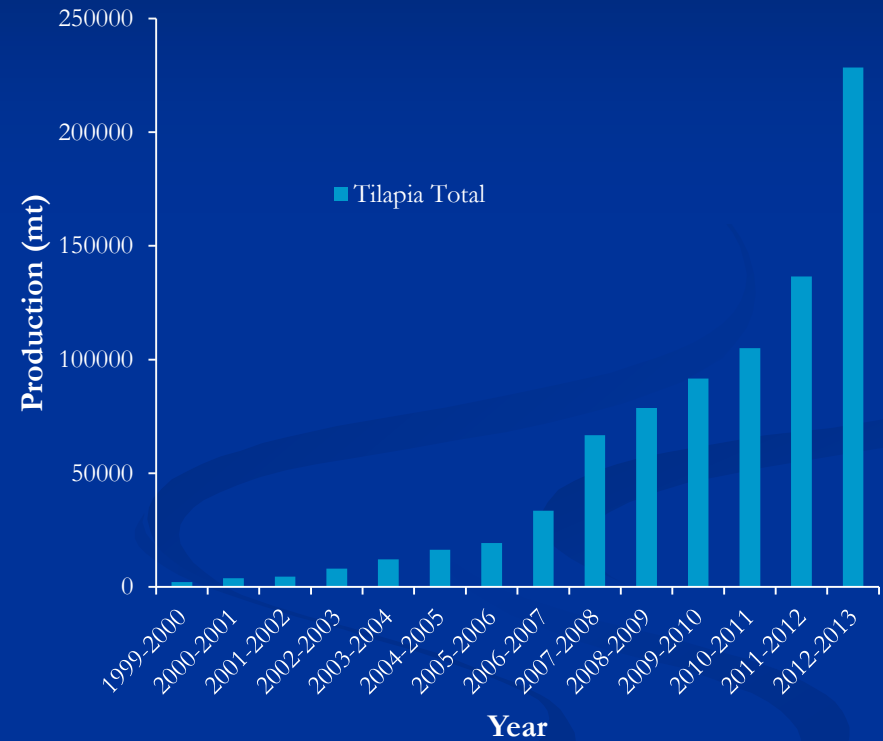
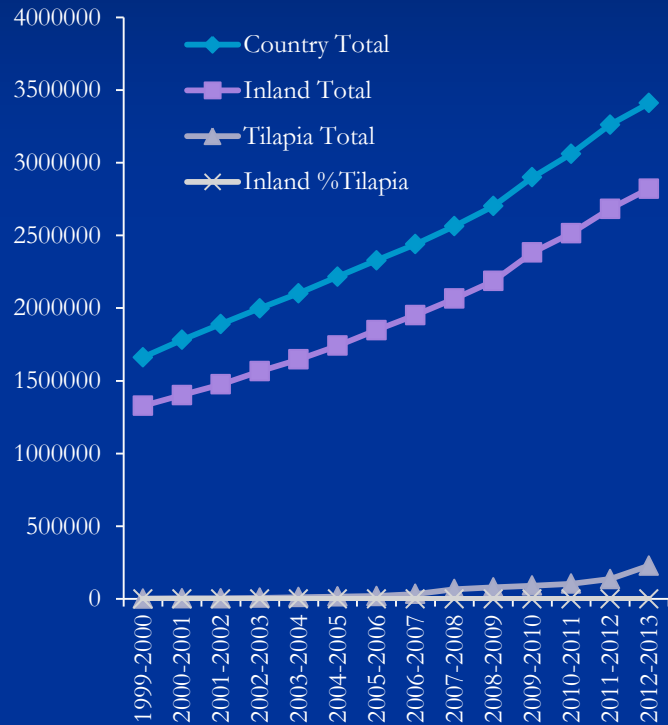
Fish production scenario along with tilapia in 2012-13

Water types		2012-13		Remarks
		Area (ha)	Produc(mt)	
Inland openwaters	Rivers & estuaries	1,031,563	151,732	
	Beels & haors	114,161	75,460	
	Kaptai lake	68,800	7,025	Tilapia 169 mt
	Flood land	2,702,304	701,330	
Capture total		3,916,828	961,458	
Closed water	Ponds & ditches	501,797	1,647,427	Tila. 209,519 mt
	Oxbow lake	5,488	6,146	Tila. 131 mt
	Coastal shrimp & fish farm	275,274	206,235	Tila. 18,631 mt
Culture total		782,559	1,859,808	
Inland total		4,699,387	2,821,266	Tila. 228,450 mt

Trend of tilapia production during 1999-2013

Year	Total fish pro. (mt)	Inland fish pro. (mt)	Tilapia pro. (mt)	Tilapia % inland pro.
1999-2000	1,661,384	1,327,585	2,140	0.16
2000-2001	1,781,059	1,401,560	3,830	0.27
2001-2002	1,890,459	1,475,039	4,510	0.31
2002-2003	1,998,197	1,566,289	10712	0.68
2003-2004	2,102,026	1,646,819	12,100	0.73
2004-2005	2,215,957	1,741,360	16,300	0.94
2005-2006	2,328,545	1,848,735	19,268	1.04
2006-2007	2,440,011	1,952,573	33,576	1.72
2007-2008	2,563,296	2,065,723	66,767	3.23
2008-2009	2,701,370	2,186,726	78,780	3.60
2009-2010	2,899,198	2,381,916	91,650	3.85
2010-2011	3,061,687	2,515,354	105,008	4.17
2011-2012	3,261,782	2,683,162	136,541	5.09
2012-2013	3,410,254	2,821,266	228,450	8.10

Trend of tilapia production in Bangladesh



Fish production scenario
1999-2013

Tilapia production 1999-2013

Culture species/strain of tilapia in Bangladesh

- *Oreochromis mossambicus*

The Mossambic Tilapia introduced in 1954, but the attempt was unsuccessful.

- *Oreochromis niloticus*

The Nile Tilapia commonly known as nilotica introduced in 1974 as well as 1987 which was not also succeeded because of lack of technological know-how.

- GIFT, Chitralada, Genomour strain and Monosex Tilapia

Attempts had been taken for the expansion of Tilapia culture with the introduction of GIFT strain in 1994 and 2005, 2011, 2012; Genomour strain in 2003 and Chitralada strain in 2007. Monosex Tilapia (all male) fry produced significantly in different parts of the country with the establishment of hatcheries. GIFT and Monosex Tilapia widely cultured.

Culture species/strain of tilapia in Bangladesh (contd.)

- ***O. mossambicus*: 1954**



- ***O. niloticus*: 1974**

- ***O. niloticus*: 1987**



Culture species/strain of tilapia in Bangladesh (contd.)

- **Red tilapia strain: 1988, 2005**



- **GIFT strain: 1994, 2005, 2011
2012**
- **Genomour strain: 2003**



Tilapia Hatcheries in Bangladesh

Division	No. of hatchery	Remarks
Dhaka	64	A few nos. of unrecorded hatcheries
Chittagong	62	
Rajshahi	05	
Khulna	31	
Sylhet	01	
Barisal	13	
Rangpur	05	
Total	181	

Tilapia culture pattern in Bangladesh

- **Monoculture**

Mainly GIFT and Monosex male cultured widely.
Production recorded 27713 kg/ha/year.

- **Monoculture in cage**

GIFT and Monosex male cultured widely. Production recorded 13832 kg/ha/year.

- **Tilapia with *Pangasius***

GIFT, Monosex male and *Pangasius* are cultured.
Production recorded 12350 kg/ha/year.

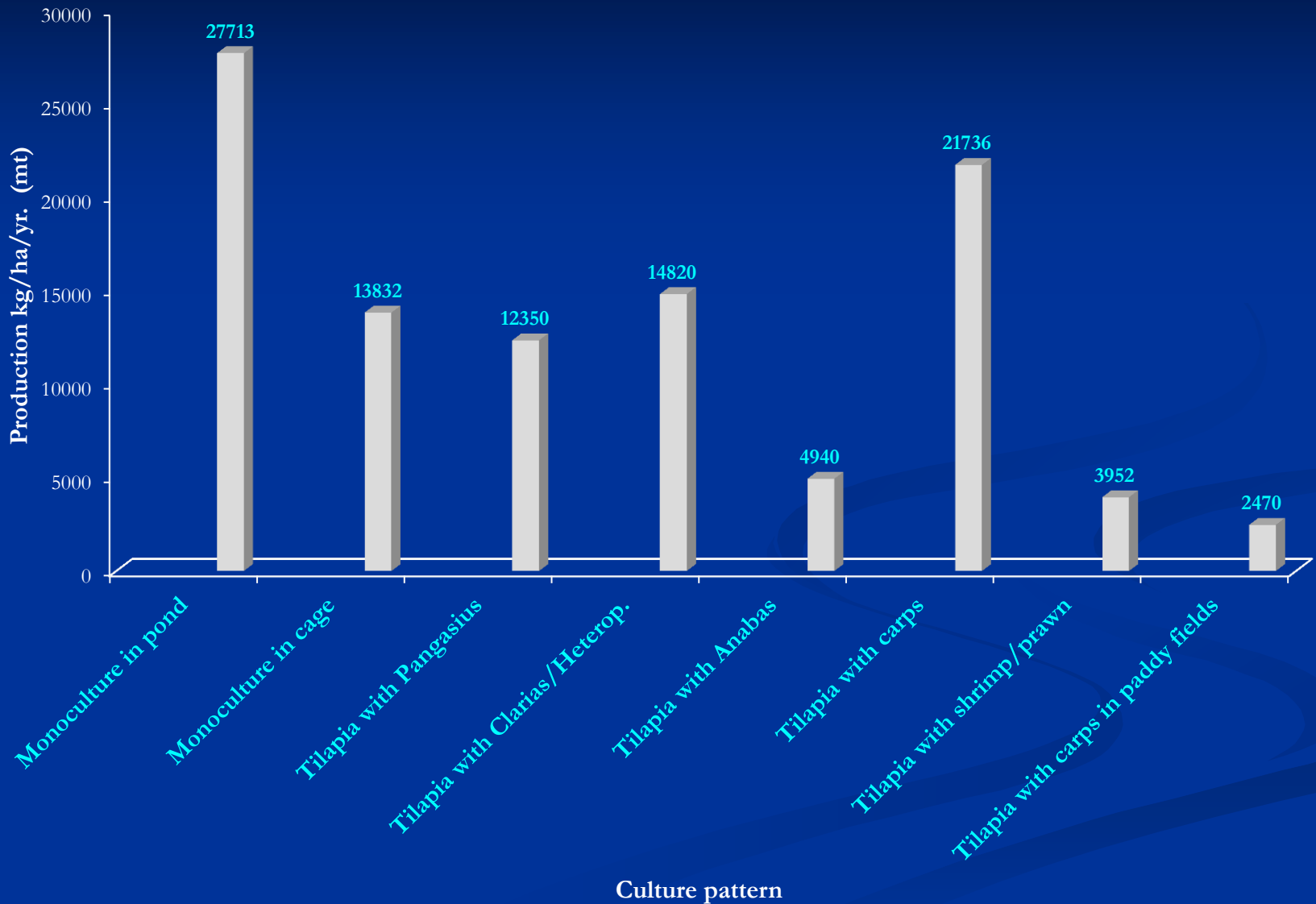
- **Tilapia with *Clarias/Heteropneustes***

GIFT, Monosex male and *Clarias/Heteropneustes* cultured . Production recorded 14820 kg/ha/year.

Tilapia culture pattern in Bangladesh (contd.)

- Tilapia with *Anabas*
GIFT, Monosex male and *Anabas* cultured . Production 4940 kg/ha/year.
- Tilapia with carps
GIFT, Monosex male and carps cultured . Production 21736 kg/ha/year.
- Tilapia with shrimp/prawn
GIFT, Monosex male and shrimp/prawn are cultured.
Production 3952 kg/ha/year.
- Tilapia with carps in paddy fields
GIFT, Monosex male and carps are cultured in the paddy fields.
Production 2470 kg/ha/year.

Tilapia culture pattern in Bangladesh with production



Source: www.seatglobal.eu

Government initiative for the expansion of tilapia aquaculture

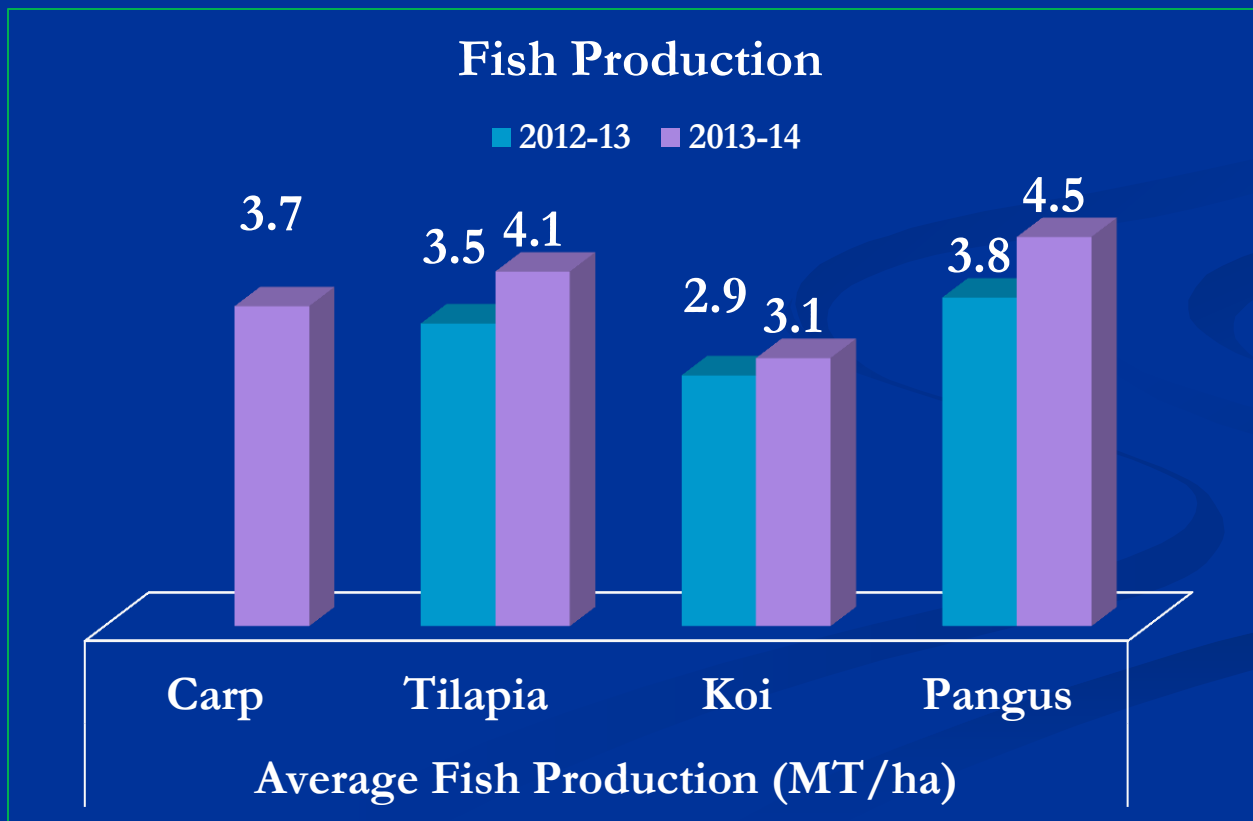
■ Integrated Agricultural Productivity Project activities

Activities	Target (2011-2016)	Achievement (June/14)	Remarks
Fish Farmer Gr. Form.	2433 No.	1329 No.	Tilapia is an important part
Nursery Demonstration	1512 No.	1028 No.	
Fish Culture Demo.	4932 No.	3039 No.	
Farmers Training	61525 Persons	24050 Persons	
Officer/Staff Training	360 Person	200 Person	
Fry/Fingerling Distn.	51668 Person	27881 Person	
Cage Culture Demo.	75 No.	22 No.	
Pen Culture Demo.	12 No.	4 No.	
Farmers Rally/Field Day	324 No.	108 No.	
Regional Workshop	6	4	
Exchange Visit	22 No.	6 No.	

Government initiative for the expansion of tilapia aquaculture

- Integrated Agricultural Productivity Project activities (contd.)
- Adoption (Only seeds distributed to the farmers)

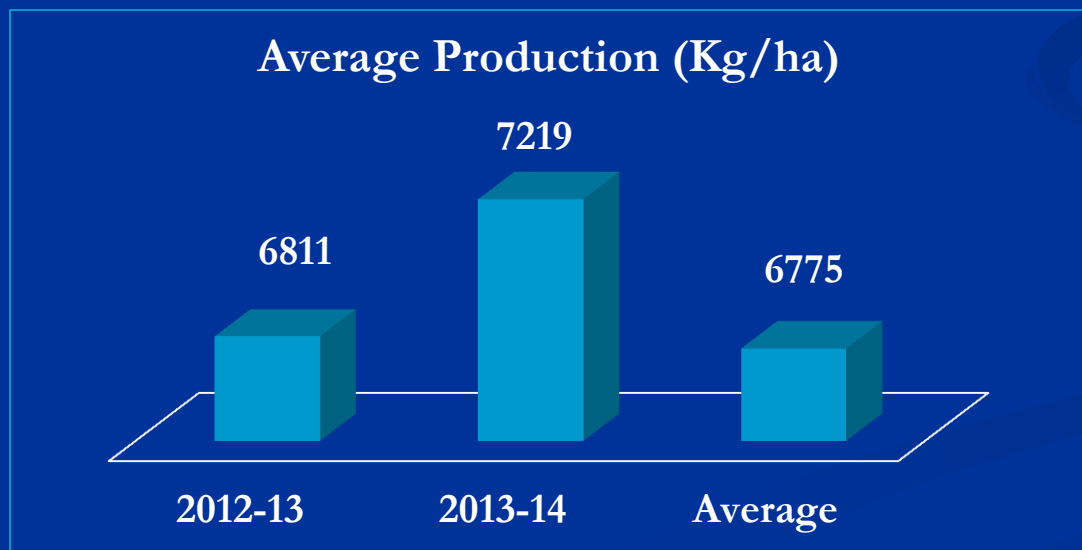
FY	SEEDS (No. of Farmers)				Total
	Carp	Tilapia	Koi	Pangus	
2012-13	0	4875	2436	2064	9375
2013-14	3235	9233	1575	4463	18506



Government initiative for the expansion of tilapia aquaculture

- Integrated Agricultural Productivity Project activities (contd.)
- Semi Intensive Tilapia Production (Subsistence-small ponds,)

FY	No. of Demo	Average Pond Size (Acre)	Total Pond Size (Acre)	Total Production (KG)	Average Production (Kg/ha)	Average Size(gm)	Profit (%)
2012-13	750	0.28	212.41	554350	6811	186	80.34
2013-14	660	0.27	178.17	516905	7219	181	79.04
	1410	0.275	390.58	1071255	6775	184	80

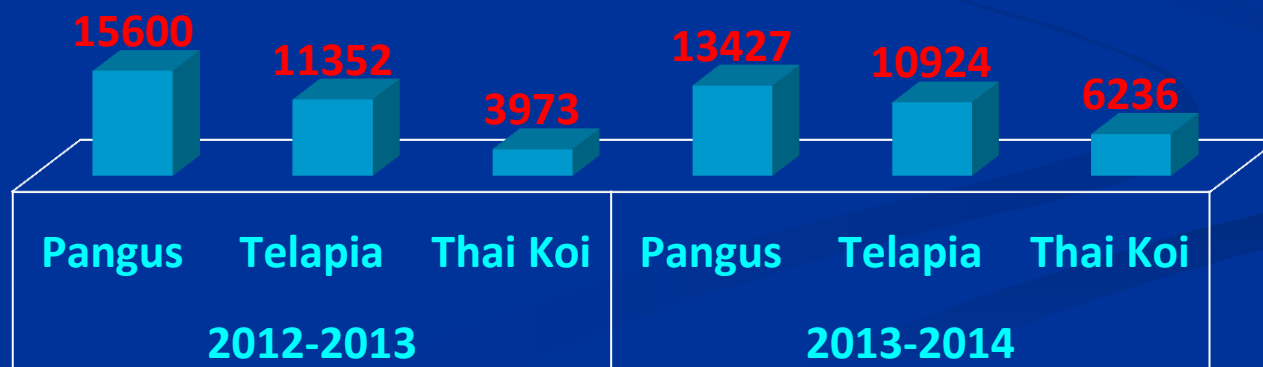


Government initiative for the expansion of tilapia aquaculture

- Integrated Agricultural Productivity Project activities (contd.)
- Intensive Tilapia Production (Subsistence-small ponds)

FY	Variety	Av. Size of Pond (Acre)	No. of Demo	Total Area (Acre)	Total Produc. (KG)	Av. Produc. (kg/ha)	Average Size (gm)	Profit (%)
2012-2013	Pangus	0.37	26	9.36	100416	15600	577	71
	Telapia	0.36	54	19.65	84362	11352	185	75
	Thai Koi	0.32	28	9.6	20728	3973	71	65
	Summary	0.35	108	38.61	205506	13147	278	70
2013-2014	Pangus	0.34	26	8.71	47482	13427	675	144
	Telapia	0.29	54	15.83	67993	10924	202	291
	Thai Koi	0.26	28	7.14	17932	6236	123	249
	Summary	0.30	108	31.68	133407	10401	333	228

Average Production (kg/ha)



Government initiative for the expansion of tilapia aquaculture

■ Integrated Agricultural Productivity Project activities (contd.)



IAPP nursery demo. pond



IAPP carp demo. pond

Government initiative for the expansion of tilapia aquaculture

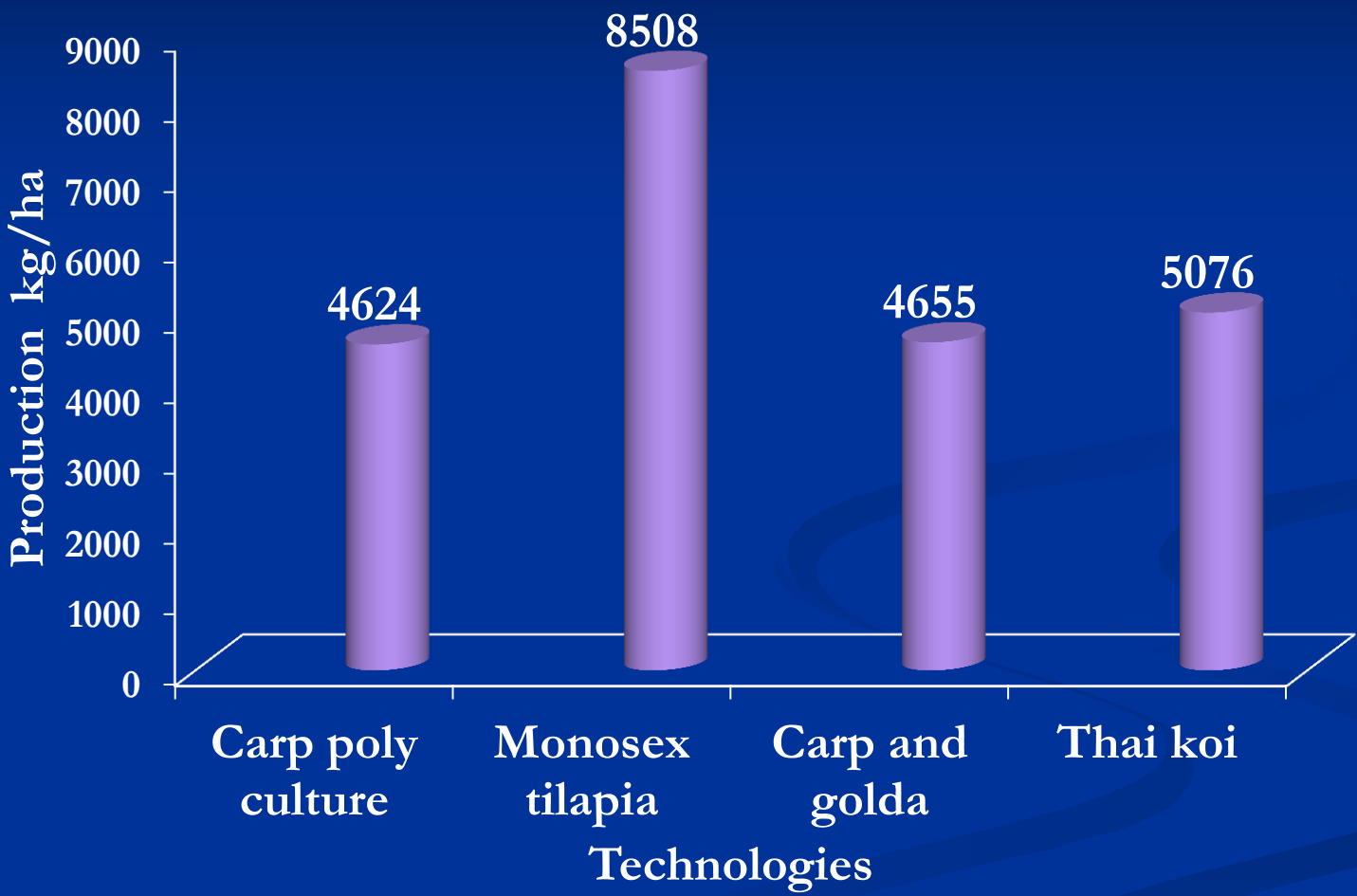
■ National Agricultural Technology Project activities

Activities	Target (208-2014)	Achievement	Remarks
CIG (Group) Formation (No.)	2400	2670	Tilapia was an important part (GIFT, Monosex tilapia)
Upazila Extn. Plan (No.)	120	120	
Farmers Training (No.)	36000	40050	
Running of FIAC	1200	732	
Technology demonstration(No.)	2400	5336	
Technology adoption (%)	60	100	
Technology diffusion (Ratio-CIG to non CIG)	1:4	1:4.83	
Impact on fish yield (%)	10	42-193	
Impact on household income (%)	20	37	

Source: Annual report, 2014, DoF, Bangladesh

Government initiative for the expansion of tilapia aquaculture

■ National Agricultural Technology Project activities



Yield performances of major demonstrated technologies

Government initiative for the expansion of tilapia aquaculture

- National Agricultural Technology Project activities



NATP tilapia demonstration pond

Government initiative for the expansion of tilapia aquaculture

■ Tilapia in the paddy fields

There are about **8 million ha** paddy fields of which **2.8 million ha** is very **potential**. DoF along with partner NGOs has taken initiatives and SHISHUK (an NGO) achieved 2100 kg/ha/year fish production from community based flood plains (paddy fields). Rice-fish culture is being practiced in different parts of the country **yielding 300-500 kg/ha/year** fish where **tilapia is an important stocking species**.



A view of rice-fish plot at Dinajpur

Government initiative for the expansion of tilapia aquaculture

■ Cage culture of tilapia

At least two development projects and a number of NGOs have been working with cage culture using different materials like bamboo, steel rod, net and feed and feed ingredients like rice bran, fish meal, green grass, etc. to culture fish species like monosex tilapia, *pangasius*, *Clarias*, *Heteropneustes*, rohu, GIFT, silver barb etc. **Case culture of monosex tilapia** is being practiced in different regions of Bangladesh. In 2011, about 6750 mt of fish produced from **6000 cages** where production was found **15 kg/cubic meter**.



A view of cage fish culture in Dakatia river

Government initiative for the expansion of tilapia aquaculture

■ Pen culture

In recent years, pens are made with different materials like bamboo, net, iron-meshed, wooden pillar etc. and becoming popular day by day. Feeds are also applied . The area and culture period varies with the availability of water.

Tilapia is also reared in the pens.

Government initiative for the expansion of tilapia aquaculture

- Training under revenue budget in 2013-2014

Subject	No. of batch	No. of beneficiary
Monosex tilapia culture	130	2600
Tilapia/ carp nursery	170	3400
Total	300	6000



Farmers training

Government initiative for the expansion of tilapia aquaculture

Rotational breeding program for quality seed production of new GIFT strain

Generation of selection

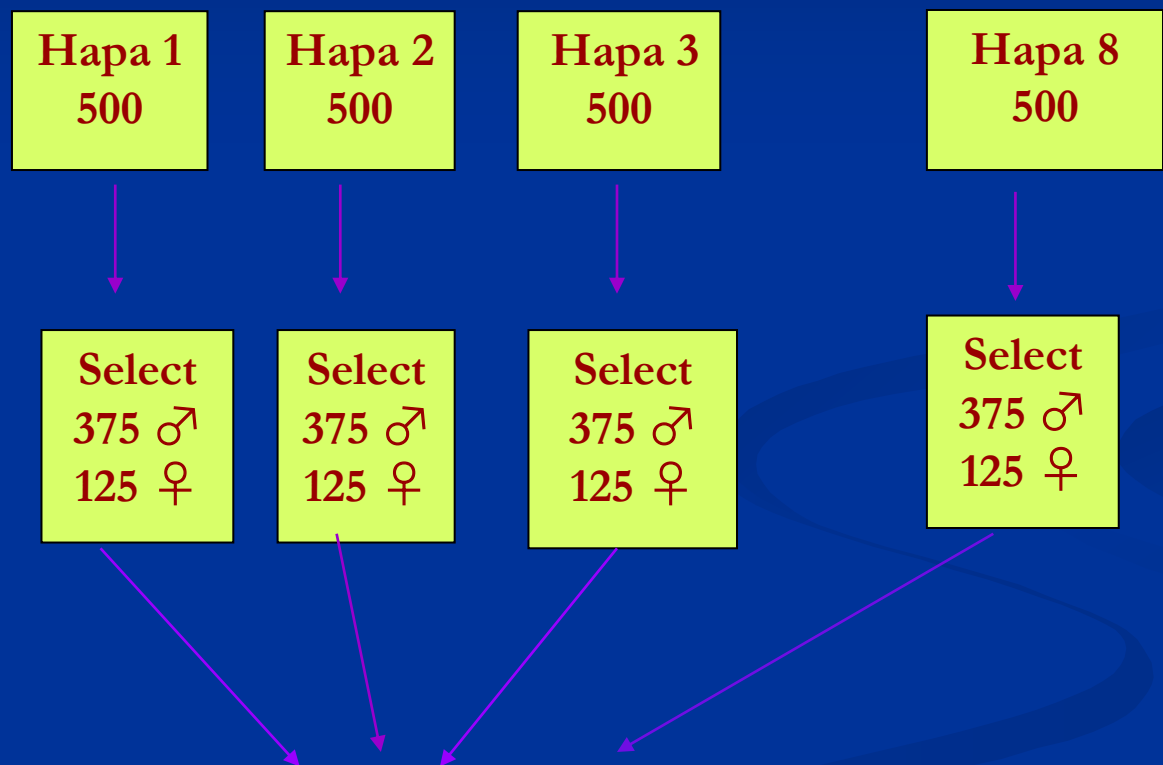
1. Collection of fingerlings of F-1 generations from 8 hapas (500 individuals per hapa)
2. Rearing in 8 separate hapa
3. The fish were reared in hapas until sexual maturity (100 to 120 g)



Government initiative for the expansion of tilapia aquaculture

Rotational breeding program for quality seed production of new GIFT strain

■ Lay out of the tilapia breeding Scheme



Applying the mating strategies in diagram 1 and 2

Government initiative for the expansion of tilapia aquaculture

Rotational breeding program for quality seed production of new GIFT strain - Rotational mating scheme of tilapia

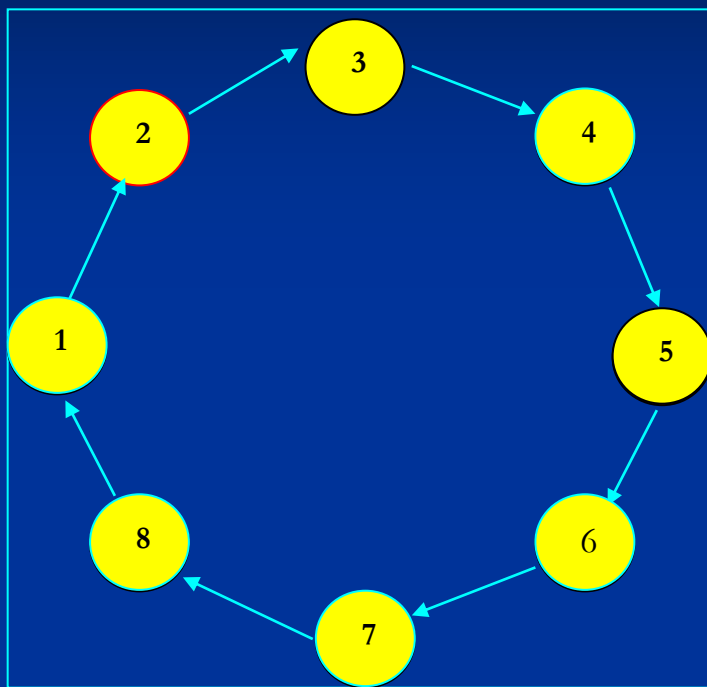


Diagram 1: Rotation of males for generation 1, 3, 5 and so on

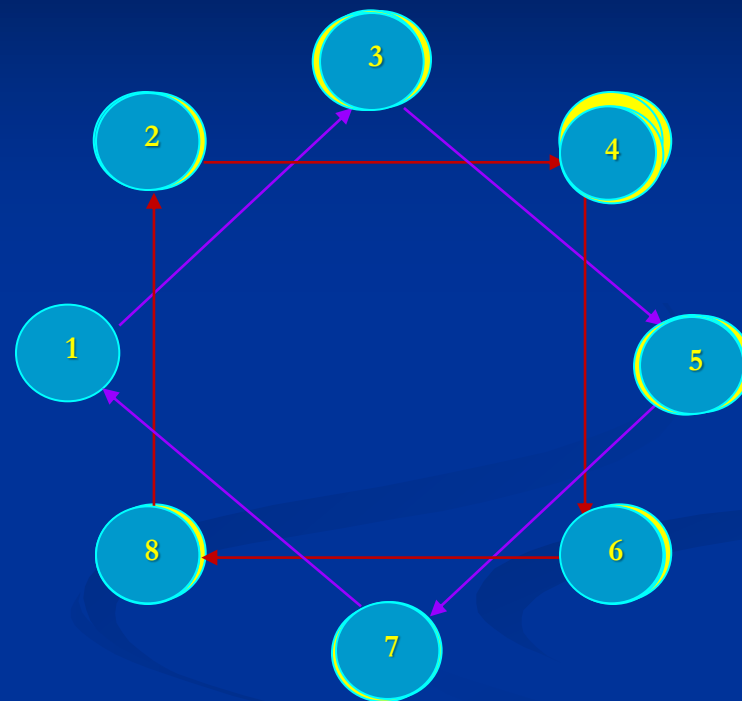


Diagram 2: Rotation of males for generation 2, 4, 6 and so on

Males from hapa-1 will be shifted to mate with females of hapa-2, while males from hapa-2 will go to hapa-3 and so on.

Follow the rotational mating program as shown in Diagram 2. The males from hapa-1 will move to mate with females of hapa-3 while males of hapa-2 will go to hapa-4 and so on.

Government initiative for the expansion of tilapia aquaculture

Rotational breeding program for quality seed production of new GIFT strain

4. In each hapa, select the best 125 males and 375 females in terms of size (ie. good body shape and weight) as parents of the second generation.
5. Rotational breeding programs were followed that as shown in Diagram 1. males from hapa-1 were shifted to mate with females of hapa-2;
6. While male from hapa-2 were shifted to hapa-3 and so on

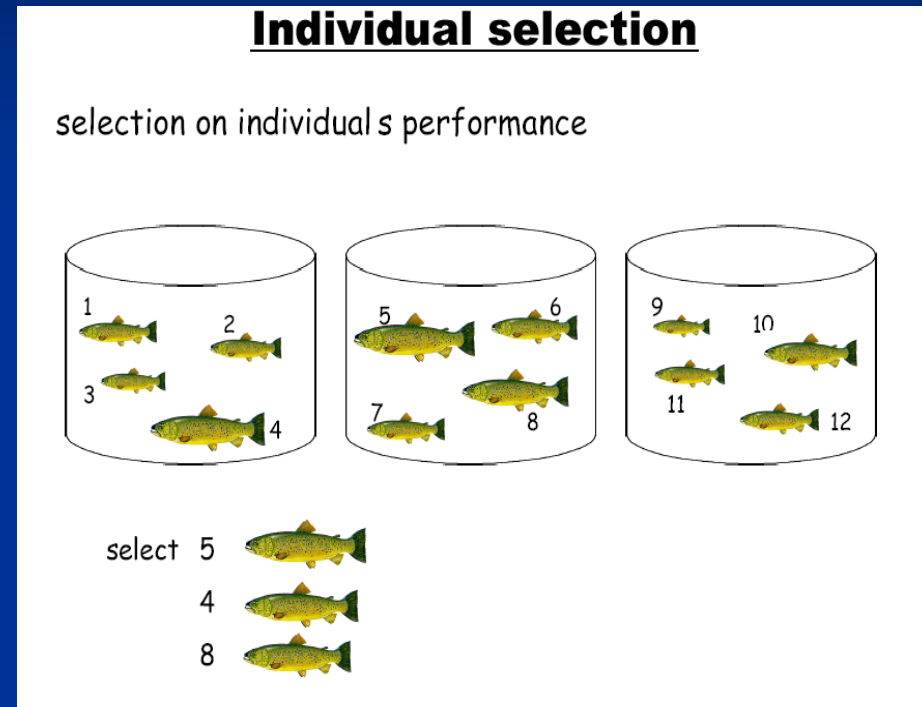
Government initiative for the expansion of tilapia aquaculture

Rotational breeding program for quality seed production of new GIFT strain

7. Females were stayed in their respective hapas
8. After breeding, 2000 fry per mating hapa were collected and reared in another hapa until fingerlings
9. Then choose randomly 1000 fingerlings for grow-out in the respective hapa

Research and stock improvement of GIFT

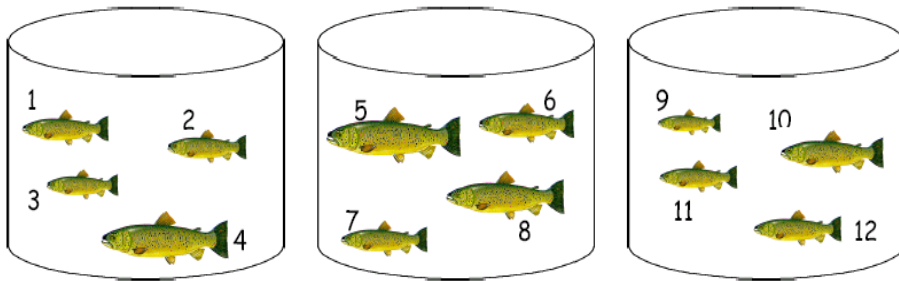
- BFRI in collaboration with WFC conducting research through individual selection, family selection and other genetic means to develop improved breed of tilapia and found better performances in subsequent generations (F1, F2, ----- F7) compared to founder stock.






Research and stock improvement of GIFT (contd.)

Family selection

selection on average family performance



select 5 
8 
6 



Improved breed for
aquaculture

F6 generation of selected group was found 32.6% superior over
non-selected control group

Institutional and legal frame work:

- Institutional: Involved with the dev. of tilapia also

Govt./Autonomous/Int'l Organizations	Responsibilities
DoF, Bangladesh	Dev. and management of aquaculture and Inspection & quality control
BFRI,WFC	Aquaculture research and development
BFDC	Product dev., quality control & market
BARC	Coordination, montoring & eva. of res.
Faculty of Fish., BAU	Fisheries education & research
DU, RU, KU, SAU	Fisheries education & research
Institute of Mar. Sci., CU	Marine fisheries edu. and research
Hazi Sc & Tech Varsity	Fisheries education & research
SFMM college	Fisheries education

Institutional and legal frame work:

■ Institutional (contd.):

Non Govt. Organizations	Responsibilities
BRAC	Aquaculture extn. And development
Mennonite Central Com.	Aquaculture extn. And development
Proshika	Aquaculture extn. And development
RDRS, Bangladesh	Aquaculture extn. And development
CARITAS, Bangladesh	Aquaculture extn. And development
TMSS, Bangladesh, etc	Aquaculture extn. And development

Institutional and legal frame work:

- Legal: Act as supportive to enhance production of safe fish including tilapia
- **The Protection and Conservation of Fish Act, 1950**
- Bengal Tank Improvement Act, 1939
- Fish and Fish Products (Inspection and Quality Control) Ordinance, 1983
- Fish and Fish Products (Inspection and Quality Control) Rule, 1997
- **Fish Feed and Animal Feed Act, 2010**
- **Fish Hatchery Act, 2010**

Role of tilapia aquaculture in the national food security:

- Fishes provide 60% animal protein where contribution of tilapia in 2012-2013 exceeds 11% which is remarkable as an exotic species
- In 2012-2013 tilapia contributed 8.1% and 12.28% to the total inland fish production and inland culture fish production respectively
- About 17.1 million people directly or indirectly depends on fisheries sector where contribution of tilapia no less than 1.1 million
- At present contribution of tilapia in GDP and agricultural GDP exceeded 0.3% and 1.56% respectively
- Bangladesh started to export tilapia and in 2012-2013 it was 333 mt valued Tk.36.4 million.

Role of tilapia aquaculture in the national food security:

- The market price of tilapia is within the range of 1-1.5 US \$ and hardly 2.0 US \$ which is within the purchasing capacity of low income group people, thus it is playing a vital role in the national food security and nutrition
- As tilapia expanding rapidly the linked industries also growing fast resulting expansion of market and marketing, feed industry, tilapia seed-hatchery, nursery, grow-out farms, fry trading, transportation, etc. making positive change towards employment and national economy
- As tilapia is easy to harvest and sometimes day to day harvest of low priced fish, farmers usually consume it more as harvest from kitchen pond rather than using as cash crop. So, it play vital role in animal protein intake by the poor

Role of tilapia aquaculture in the national food security:



People engaged in tilapia whole and retail selling

Constraints:

- Inadequate quality tilapia seed and feed in time with judicious price
- Domestic and international marketing chain are not always favourable for growers
- Production of fry from YY super male till now not in the reach of people
- Indiscriminate use of hormone in producing monosex all male tilapia fry
- Inadequate preservation and processing facilities
- Lack of access to low interest credit facilities
- Drought contracts aquatic habitat, threat to the aquaculture expansion
- Point and non-point source of pollution are deteriorating aquatic ecosystem which are also negative to aquaculture production
- Inadequate research and development activities

Constraints: (Contd.)

- Climate Change- early flood, late monsoon, early winter are contrary to aquaculture production
- Ignorance about Fish Act and code of conduct for responsible fisheries -barrier in expanding safe fisheries
- Stocking with inbred and genetically eroded species/strain exerts negative impact on the fisheries
- Decreased water flow exerts serious concern in inland fisheries
- Inadequate regional and international cooperation to take integrated effort in aquaculture management
- People's participation and lack of coordinated effort among the stakeholders (GO. NGO, Farmers, etc)

Recommendation:

- To make available quality tilapia seed and feed in time with judicious price
- Domestic and international marketing chain should be favourable for consumers, growers and exporters
- Hormone based fry production should be replaced by YY super male and other technologies
- Indiscriminate use of hormone in producing monosex all male tilapia fry should be stopped
- Creation of more preservation and processing facilities
- Growers and marketers should have access to low interest credit facilities
- Climate issues should be taken into consideration globally to restore aquatic habitat
- Aquatic pollution is to be controlled/minimized to enhance aquaculture production

Recommendation (contd.):

Strengthening research and development focusing aquaculture production and improvement of degraded habitat

- Fish Act and code of conduct for responsible fisheries is to be maintained
- Genetic improvement of
- Bilateral and regional cooperation needed to increase water flow for the sack of inland fisheries
- Global sharing and implementation of deals for the development of tilapia aquaculture, marketing and research will enhance the industry
- People's participation and coordinated effort required among the stakeholders (GO. NGO, Farmers, etc)

Scope:

- Survey to know tilapia culture status, potentiality, trade, marketing and research
- Action research to develop quality seed, feed, culture practice, trade and marketing
- Utilization of vast inland waters- ponds, ditches, coastal waters, seasonal waters, rice fields (culture), rivers and flood waters (cage culture)
- Utilization of huge unemployed youth, farmers along with local fish feed ingredients, hatcheries, infrastructure, etc

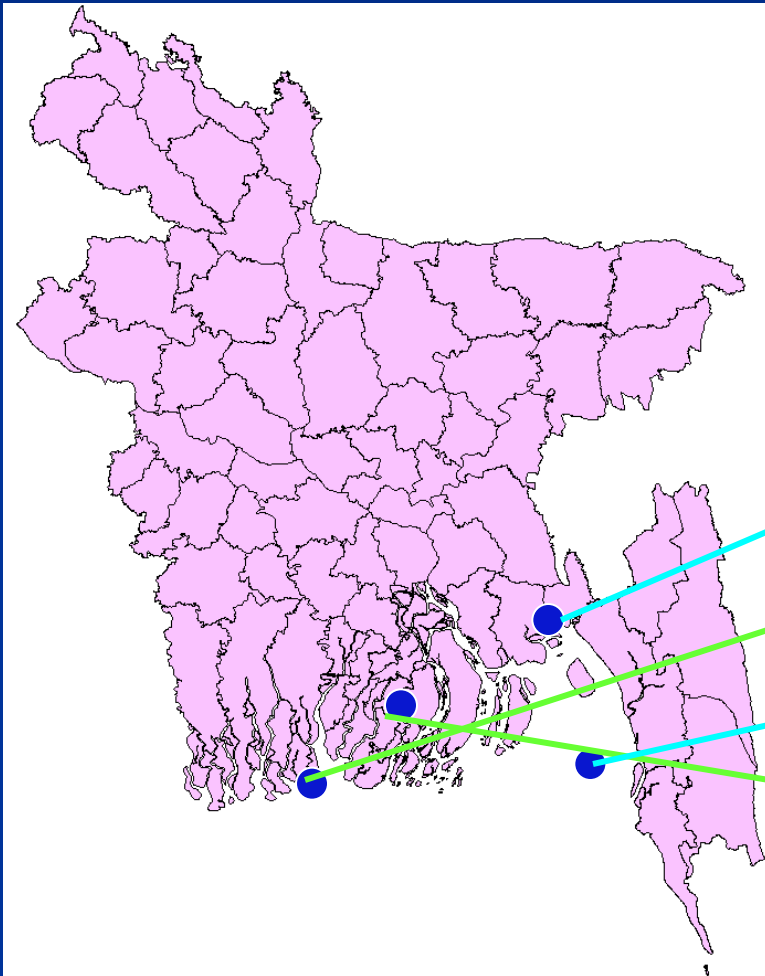
Conclusion:

- Implementation of mentioned issues need to have social and political will along with appropriate plan of action to formulate long and short term research as well as development projects
- Different countries might have different or dissimilar constraints and research and development priorities but the major objectives in terms of fish production, consumption, trade and marketing might be the same
- Strengthening technical cooperation, and in some cases economic cooperation among INFOFISH member countries as well as others might promote tilapia industry for the well being of the global people

On behalf of riverine water
resourceful delta, the
Bangladesh

Thank you all

Hilsa ground in Bangladesh



Mirersharai, Chittagong

Kalapara, Potuakhali

Kutubdia, Cox's Bazar

Char Tojumuddin, Mhola