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Organización  
de las  
Naciones  
Unidas  
para la  
Agricultura  
y la  
Alimentación

## REGIONAL COMMISSION FOR FISHERIES (RECOFI)

### Fourth Session

Jeddah, Kingdom of Saudi Arabia, 7–9 May 2007

## AQUACULTURE IN THE RECOFI AREA

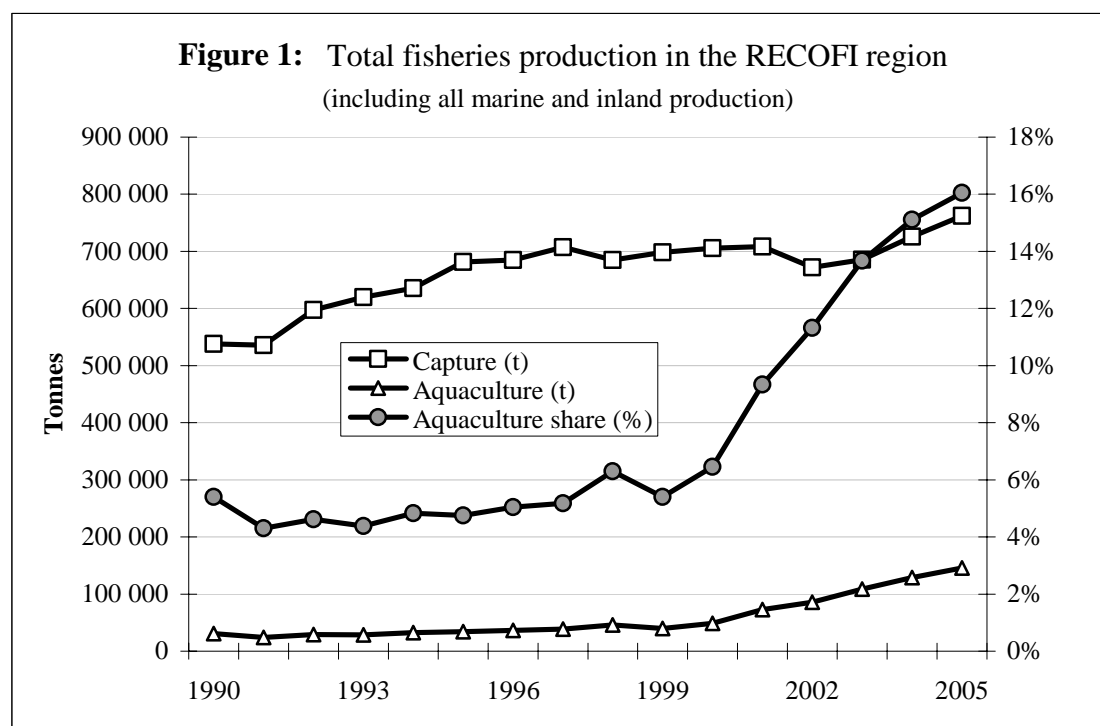
### SUMMARY

Aquaculture production in the region has continued to increase at a rapid rate. In 2005 the total output was at 145 683 tonnes representing an average annual increase of 24.1 percent from the 1999 total. The share of aquaculture production over the fisheries total has steadily increased. Inland production still accounts for >80 percent of the total aquaculture production. However, the fastest growing sector has been the mariculture/brackish water sectors, jointly accounting for nearly 15 percent of aquaculture production in 2005. The document further provides summary aquaculture statistics in all RECOFI countries. Across the region, aquaculture is expected to grow, in some countries this growth is expected to be significant. There are no universal trends in changes in aquaculture since the individual combination of geophysical, economic and social factors in each country affects the farming systems that are practiced at present, and can be developed in future. The main trends in food fish production are (1) increased culture of marine species; (2) intensification; and (3) more integrated agriculture-aquaculture. Within marine species, both diversification and intensification are anticipated, driven by such forces as successful research by government laboratories providing technical knowledge and seed stock, availability of private investment, and potential export markets. Intensification is mainly driven by such forces as limited availability of land and water.

## I AQUACULTURE PRODUCTION OVERVIEW

1. Aquaculture production in the countries of the RECOFI region has continued to increase at a rapid rate in recent years. During the Third session of the Commission the production statistics up to 2003 were reported. In 2003 the total aquaculture production of 108 059 tonnes (now revised to 108 560 t) represented an average annual increase of 28.3 percent from the 1999 total of 39 870 tonnes. In 2005 the total recorded aquaculture output in the region was calculated at 145 683 tonnes representing an average annual increase of 24.1 percent from the 1999 total. Over the last fifteen years total production from capture fisheries (including inland and all marine production) has been relatively constant at around 700 000 tonnes/year. Thus the share of production in the RECOFI countries coming from aquaculture has been increasing as shown in Figure 1

particularly after 1999. The growth of aquaculture production in the region is further detailed by country (Table 1), and by ISSCAAP<sup>1</sup> species group and individual species (Table 2 and 3).



2. In the RECOFI region, inland production still accounts for over 80 percent of the total aquaculture production. Carps accounted for 59 percent of total production in 2005, followed by rainbow trout (*Oncorhynchus mykiss*). However, the fastest growing sector has been the mariculture/brackish water sectors, jointly accounting for nearly 15 percent of aquaculture production in 2005. In 2003 this share was higher at about 19 percent. This represents a large increase over the last decade (Figure 2). The large majority of this production consists of Indian white prawn (*Penaeus indicus*) with Saudi Arabia (11 259 t) and the Islamic Republic of Iran (8 930 t) being the major producers. Commercial-scale production of Gilthead seabream (*Sparus aurata*) and the native Sobaity seabream (*Sparidentex hasta*) has continued since the last RECOFI session in 2003 however production appears to have declined, as the United Arab Emirates, Oman and Kuwait have reported reduced production values as compared to those reported in 2003. The status of mariculture production by country is detailed in Figure 3.

**Table 1:** Aquaculture production (t) in the RECOFI region by country (1980–2005).

Country	1980	1990	2000	2001	2002	2003	2004	2005
Iran (Islamic Rep. of)	9 263 F	27 147	40 550	62 550	76 817	91 714	104 330	117 354
Saudi Arabia	-	1 988	6 004	8 218	6 744	11 824	11 172	14 375
Iraq	3 622 F	1 600	1 745	2 000 F	2 000 F	2 000 F	12 196	12 870
United Arab Emirates	-	<0.5	<0.5	<0.5	<0.5	2 300 F	570 F	570 F
Kuwait	...		376	195	195 F	366	375 F	327
Oman	-	-	<0.5	<0.5	<0.5	352	503	173
Qatar	-	-	<0.5	1	<0.5	<0.5	<0.5	11

<sup>1</sup> ISSCAAP = International Standard Statistical Classification of Aquatic Animals and Plants.

Bahrain	...	-	12	<0.5	3	4	8	3
<b>TOTAL</b>	<b>12 885</b>	<b>30 735</b>	<b>48 687</b>	<b>72 964</b>	<b>85 759</b>	<b>108 560</b>	<b>129 154</b>	<b>145 683</b>

**Source:** FAO Fishstat Plus v. 2.32; Aquaculture production: quantities 1950–2005.

**Note:** "F" indicates FAO estimate, "..." indicates the data are not available, "-" indicates zero production.

**Table 2:** Aquaculture production (t) in the RECOFI region by ISSCAAP species groups (1980–2005).

ISSCAAP Group	1980	1990	2000	2001	2002	2003	2004	2005
Carps, barbels and other cyprinids	12 776	27 864	29 245	44 750	56 801	63 084	77 596	86 266
Salmons, trouts, smelts	109 F	893	9 000	12 170	16 026	23 138	30 000	34 760
Shrimps, prawns	.	51	6 011	11 757	10 610	16 622	17 608	20 189
Tilapias and other cichlids	.	1 926	3 998	3 997	2 035	2 782	2 671	3 101
Miscellaneous coastal fishes	-	1	400	242	227	2 869	1 219	960
Freshwater crustaceans	-	-	-	23	30	30	27	268
Marine fishes not identified	...	<0.5	-	-	-	-	-	100 F
Miscellaneous freshwater fishes	...	-	33	25	30	35	30	34 F
Tunas, bonitos, billfishes	-	-	-	-	-	-	3	5
<b>TOTAL</b>	<b>12 885</b>	<b>30 735</b>	<b>48 687</b>	<b>72 964</b>	<b>85 759</b>	<b>108 560</b>	<b>129 154</b>	<b>145 683</b>

**Source:** FAO Fishstat Plus v. 2.32; Aquaculture production: quantities 1950–2005.

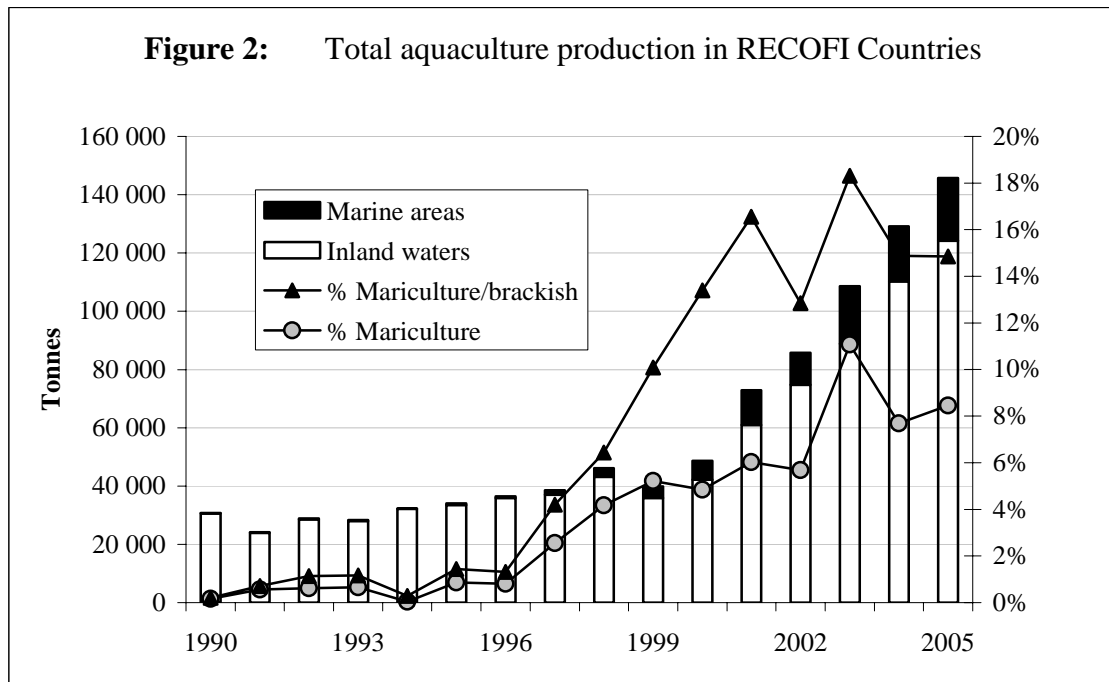
**Note:** "F" indicates FAO estimate, "..." indicates the data are not available, "-" indicates zero production.

**Table 3:** Aquaculture production (t) in the RECOFI region by individual species (1980–2005).

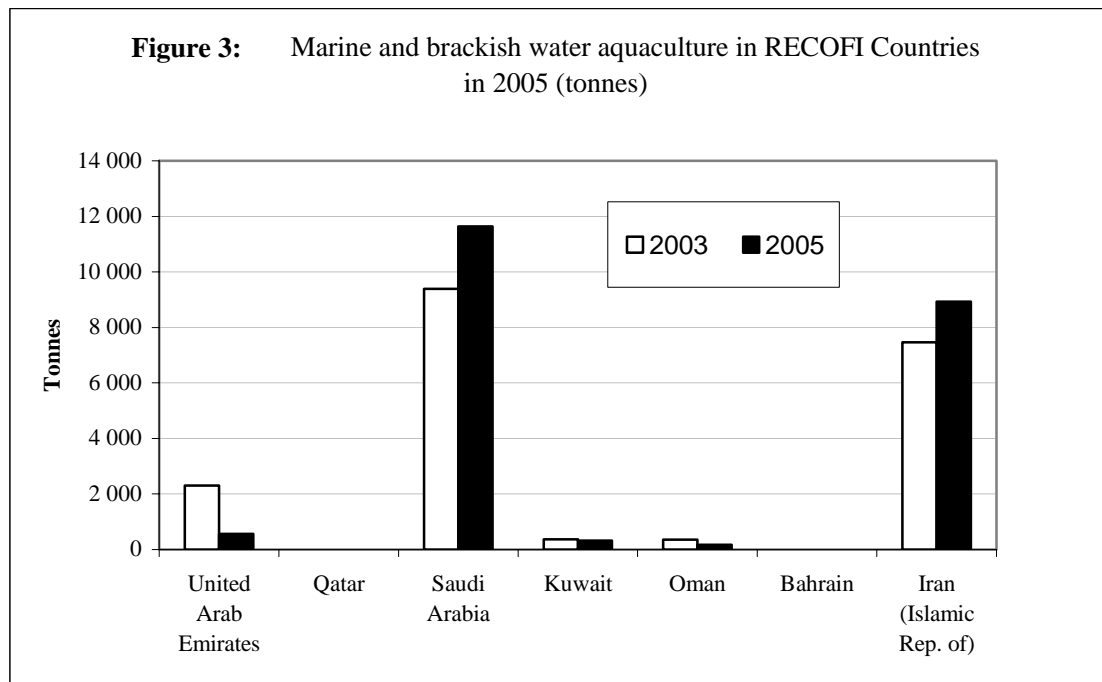
Species	Scientific name	1980	1990	2000	2001	2002	2003	2004	2005
Silver carp	<i>Hypophthalmichthys molitrix</i>	1 993	13 127	17 000	26 285	33 977	37 872	38 148	43 128
Rainbow trout	<i>Oncorhynchus mykiss</i>	109 F	893	9 000	12 170	16 026	23 138	30 000	34 760
Common carp	<i>Cyprinus carpio</i>	7 414	8 173	8 745	11 915	15 700	17 271	25 062	26 699
Indian white prawn	<i>Penaeus indicus</i>	.	.	6 011	11 757	10 610	16 622	17 608	20 189
Grass carp (=White amur)	<i>Ctenopharyngodon idellus</i>	2 969	5 252	2 000	4 135	3 836	4 276	11 116	12 769
Bighead carp	<i>Hypophthalmichthys nobilis</i>	400 F	1 312	1 500	2 415	3 288	3 665	3 270	3 670
Nile tilapia	<i>Oreochromis niloticus</i>	.	1 913	3 915	3 934	1 870	2 602	2 551	2 901 F
Gilthead seabream	<i>Sparus aurata</i>	.	.	83	43	43	1 081 F	650	467
Giant river prawn	<i>Macrobrachium rosenbergii</i>	-	-	-	23	30	30	27	268
European seabass	<i>Dicentrarchus labrax</i>	.	.	.	.	.	763 F	217 F	218 F
Sabaki tilapia	<i>Oreochromis spilurus</i>	.	-	83	63	165	180	120	200 F
Sobaity seabream	<i>Sparidentex hasta</i>	.	-	119	55	58	967 F	296 F	192 F
Marine fishes nei	<i>Osteichthyes</i>	.	<0.5	-	-	-	-	-	100 F
Flathead grey mullet	<i>Mugil cephalus</i>	-	-	-	35	20	22	18	41 F
Rabbitfishes nei	<i>Siganus spp</i>	.	1	42	27	25	27	23	41 F
North African catfish	<i>Clarias gariepinus</i>	.	-	33	25	30	35	30	34 F
Yellowfin tuna	<i>Thunnus albacares</i>	-	-	-	-	-	-	3	5
Other		0	64	156	82	81	9	15	1
<b>TOTAL</b>		<b>12 885</b>	<b>30 735</b>	<b>48 687</b>	<b>72 964</b>	<b>85 759</b>	<b>108 560</b>	<b>129 154</b>	<b>145 683</b>

Source: *FAO Fishstat Plus v. 2.32; Aquaculture production: quantities 1950–2005*.

Note: "F" indicates FAO estimate, "..." indicates the data are not available, "-" indicates zero production.



3. It is possible that a small proportion of the increases in aquaculture production for the region may derive from the fact that many of the countries in the region have recently improved their reporting of aquaculture statistics to FAO. For 2005, all countries in the region reported production statistics for aquaculture with the exception of the United Arab Emirates, whose figures are a repeat from 2004 estimates. The breakdown by species for the Kingdom of Saudi Arabia was also estimated as only a figure for total production was reported when the 2005 FAO statistics were compiled.



## II. TRENDS, ISSUES AND DEVELOPMENT<sup>2</sup>

### Trends in aquaculture

4. Across the region, aquaculture is expected to grow, in some countries this growth is expected to be significant. Beyond this, there are no universal trends in changes in aquaculture since the individual combination of geophysical, economic and social factors in each country affects the farming systems that are practiced at present, and can be developed in future.

5. When the region is considered as a whole, three trends in aquaculture are apparent, although it should be emphasized that each is not universal across the region. The main trends in food fish production are: (1) increased culture of marine species; (2) intensification; and (3) more integrated agriculture-aquaculture. Within marine species, both diversification and intensification are anticipated, driven by such forces as successful research by government laboratories providing technical knowledge and seed stock, availability of private investment, and potential export markets. Intensification is mainly driven by such forces as limited availability of land and water.

6. Marine aquaculture of both finfish and crustaceans is increasing in the region, and the increase is expected to continue. Furthermore, several countries (Bahrain, Oman, two emerging regional producer countries; Saudi Arabia, a more established regional aquaculture producer) have identified increased mariculture as a specific goal within the sector. Other mariculture trends of note are development of marine cage culture.

### Non-indigenous species recently introduced into aquaculture

7. Growth of the aquaculture sector has involved the adoption of new species, some of which are endemic to a particular country and newly farmed in that country, while others are non-endemic to a particular country and are imported for aquaculture purposes. Within the last ten years, many countries in the

<sup>2</sup> The information provided in section II of this document has been extracted and summarized from the 2006 FAO publication entitled "Regional review on aquaculture development. 2. Near East and North Africa – 2005". The entire review is made available to the Session as document RECOFI/IV/2007/Inf.11.

region have imported non-endemic aquatic species, particularly finfish, which are either established as an integral part of aquaculture production, or are being studied as potential aquaculture species.

8. A number of these newly introduced species are already contributing significantly to aquaculture production at the national level in some countries such as the Gilthead seabream (*Sparus aurata*); (ii) the Nile tilapia (*Oreochromis niloticus*) (which now forms the majority of production tonnage in Kuwait), (iii) the European seabass (*Dicentrarchus labrax*); (iv) Penaeid shrimp; and (v) the rainbow trout (*Oncorhynchus mykiss*). Iran (Islamic Rep. of) introduced this species in 1959 and it now contributes approximately 30 percent of production tonnage.

### **Driving forces**

9. The most common factor driving the growth of aquaculture in the region has been, and probably will continue to be, the need to increase the domestic food supply, partly because the wild catch may be unstable or decreasing particularly for some commercially important species. In some locations, this need for domestic supply is further strengthened by increased fish products demand – triggered by increased per capita consumption (which may result from public education campaigns and advertising), and/or, an increase in number of consumers (due to increased consumer acceptance, population growth and increased tourism). Public education campaigns and advertising are particularly important in countries with large interiors, such as Iran (Islamic Rep. of) and Saudi Arabia, where the population living inland is less familiar with buying, preparing, and eating fish, than is the segment of the population living along the coast. Thus the inland population represents new potential consumers for aquaculture products.

10. Other forces driving aquaculture in the region include the need to increase export revenues, and support of socio-economic programmes via provision of employment and affordable nutrition. Growth in aquaculture has less commonly been triggered by its favourable effects in environmental amelioration, and by the need to raise species for restocking into the wild and for recreation; this is particularly important for locally endangered species. Furthermore, a high price can also be an important driving force in aquaculture.

11. From within the sector, technical and organization progress, and improvements in infrastructure, are also important driving forces. Suitable funding (government and/or private), investment, and an organized legal framework (including effective certification and licensing) are seen as crucial to support aquaculture development across the region.

### **Priority issues**

12. Successful and sustainable development of aquaculture can be limited by a wide variety of factors. Successfully addressing four key priority issues is essential for the continued growth of aquaculture in the region: (i) farming systems, technologies and species, (ii) marketing and processing, (iii) health and diseases, and (iv) policies, legal frameworks, institutions, and investment. While there is a consensus among countries in the region about the importance of these issues, the relative importance of each of the four issues will vary from country to country, dependant largely upon the state of development of the aquaculture sector in individual countries (whether it is developing or developed).

#### *Farming systems, technologies and species*

13. Limited availability of suitable sites for new aquaculture activities is a commonly encountered problem in the region, and may be manifest as shortage of land, insufficient freshwater, insufficient tidal fluctuation for land-based culture, and few marine sites suitable for existing systems. In some cases, the pressure to find suitable sites is because few or no sites exist, and in other cases suitable sites may exist, but access to them is restricted due to concomitant needs of other user groups such as agriculture, human settlement, tourism, transport, and conservation. Further challenges for some countries, particularly those with a developing aquaculture sector, is adequate supply of finfish fry/fingerlings and reliance on imported fish feed. Furthermore, there is recognition that more research is needed to identify local endemic species

particularly of finfish that are suitable for aquaculture in order also to avoid the introduction of exotic species with the avoidance of unknown environmental impacts and to ensure customer acceptability of the products produced.

14. Research and technology transfer between countries, are seen as key solutions to developing suitable new technologies that can be adopted for use in the remaining available sites, particularly those in the marine environment. Emphasis will need to be placed on finding systems that are suitable for the specific geographic locations, and level of technology available. To address environmental concerns, undertaking Environmental Impact Assessments for aquaculture projects, and promoting farming systems that make rational use of water, are important solutions.

#### *Marketing and processing*

15. Currently, there are under-used markets within individual countries and outside the region that represent future sources of sales for food products from aquaculture. At present some of these markets are under used because they may be areas where fish is not traditionally part of the diet, or they may be countries with rigorous import regulations such as the European Union. A further challenge is seasonality of supply, when markets may be flooded with a single species at certain times of year, with consequent reduction in price.

16. There is a need to promote consumption of fish, so that number of consumers and per capita consumption will increase. This can be achieved by adoption of comprehensive marketing strategies including local marketing, increased advertising, and public education about the health benefits of eating fish. Improved labelling and traceability should also increase consumer confidence in the product, and may be particularly effective for promotion of new products such as organically raised fish (currently considered to be an important potential niche in the market). The challenges posed by seasonality of supply can be addressed in part by adding value-added products (such as tilapia fillets), with a longer shelf life compared to that of fresh fish, exporting surplus fish, and diversification of farmed species thus offering the consumer increased choice. Overall, there is a need for improved processing facilities and transport infrastructure, collaboration of existing trade networks within the region, and more effective participation by producer associations and other non-government organizations.

#### *Health and diseases*

17. Infectious disease is also a limiting factor in aquaculture growth with a variety of negative impacts including (i) causing direct economic loss due to acute and chronic losses of stock and (ii) causing economic loss due to reducing or disallowing exports. Other health problems, such nutritional problems and deformities, may also cause economic losses, but are – at present – less pervasive than infectious diseases. Health issues are of increasing importance due to intensification of aquaculture, and increasing movement of aquatic organisms within and between countries.

18. The most pressing problem is inadequate disease monitoring: among the countries in the region monitoring is reported to be adequate only in Iraq; sometimes adequate in Iran (Islamic Rep. of); and inadequate in Saudi Arabia and in the United Arab Emirates. Within the emerging producer countries, disease monitoring programmes are currently planned for the emerging producer countries of Bahrain, Kuwait, Oman and Qatar. Other key regional deficiencies in disease awareness and management are difficulties in accessing information, an absence of specialists, and a scarcity of suitably qualified diagnostic laboratories. The latter is of particular concern for virus diseases, which are considered to be under reported in the region, in part due to limited detection and diagnostic capability. Several countries send diagnostic samples outside the region for work up, including to Great Britain and the United States of America. Furthermore, quarantine procedures and facilities are inadequate in some instances, and in a number of countries there is no regulation or legislation pertaining to chemicals and drugs approved for use in aquaculture.

19. In order to address these deficiencies, the following solutions are urgently needed: training in correct sample collection and preparation, distribution and effective use of manuals for identification of etiological agents, establishment of – and adherence to – a regional code of conduct (or other recognizable standards of practice), implementation of a regional alert/notification system for disease outbreaks, and adoption of effective quarantine practices. Overriding all of this, there is an urgent need to establish a comprehensive regional centre of expertise in fish health, with a capability for undertaking virology work.

*Policies, legal frameworks, institutions and investment*

20. Effective policies, legal frameworks and institutions are necessary prerequisites for the development of aquaculture; however across the region there are circumstances where policies were or are absent, obscure, or complicated, thus hindering aquaculture. Obstacles include numerous agencies needing to be consulted for addressing single or limited issues, long periods of time being required for bureaucratic procedures, contradictory laws, rigid policies, and a lag between the speed of development of the administrative framework supporting the aquaculture industry and the faster speed of development of the aquaculture industry itself.

21. Some key challenges in the aquaculture sector in any one country may have to confront are a lack of coordination between the multiple agencies that share regulatory responsibility, legislation that may not be in harmony with present and future status of the industry and with other related legislation, and unclear and or conflicting priorities within the policy making and regulatory spheres. Furthermore, the coordination of the policies and laws pertaining to aquaculture between the countries in the region is widely – but not universally – considered to be inadequate (attributable in part to diverse legislative systems, aquaculture standards and priorities in different countries).

22. To rectify these problems, a multi-faceted approach is needed including: development of a comprehensive management plan for aquaculture development for countries where such a plan does not already exist, regular dissemination of information by the sector to the regulatory agencies in order to promote a unified understanding of the needs of the sector, conducting regular meetings between different regulatory agencies and between the agencies and their constituents in order to achieve exchange of information and improved coordination, harmonization of identification of priorities, harmonization of and possible amendments to laws relating to aquaculture, and promotion of active inter-regional coordination of national policies as far as is practicable.