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Global Trade Conference on Aquaculture

29–31 May 2007
Qingdao, China

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29–31 May 2007
Qingdao, China

Edited by
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FAO Fisheries and Aquaculture Department

and

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Rome, 2007

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Preparation of this document

These proceedings contain the full papers and abstracts of presentations from the first Global Trade Conference on Aquaculture, held in Qingdao, China from 29 to 31 May 2007.

The conference was organized by the FAO Fisheries and Aquaculture Department in cooperation with the FISHINFONetwork. The national preparation and the identification of speakers from the host country were the responsibility of INFOYU. International promotion was initiated by GLOBEFISH and INFOFISH, which was also in charge of the registration of international participants.

The Conference was hosted by the Chinese Ministry of Agriculture with the support of its Bureau of Fisheries and the Society of Fisheries. The technical editing, publishing and distribution of this document were undertaken by FAO, Rome.

Abstract

These proceedings contain the manuscripts and summaries from the first Global Trade Conference on Aquaculture, held in Qingdao, China from 29 to 31 May 2007. A total of 23 papers (2 keynote presentations and 21 session presentations) and six abstracts are published, together with the programme and the opening and closing remarks.

The conference was organized by the FAO Fisheries and Aquaculture Department in cooperation with the FISHINFONetwork. National preparation and the identification of speakers from the host country were the responsibility of INFOYU; international promotion was initiated by GLOBEFISH and INFOFISH, which was also in charge of the registration of international participants.

The conference was developed in five sessions. In the first session, "Aquaculture Growing Strength", an overview on production and trade was followed by five commodity presentations showing the success in shrimp, salmon, tilapia, catfish and bivalve aquaculture.

The second session on "Challenges" highlighted the current and future challenges facing the sector. These included challenges related to assuring food safety in aquaculture products, maintaining and improving consumers' perceptions of the quality and environmental acceptability of aquaculture, improving aquatic animal health management, addressing issues related to feed quality and availability, and improving the view investors take to assure economic and financial sustainability.

During the third session, the "Advantages and Opportunities" of aquaculture were covered by taking into account the globalization process and the requirements of processors and the food service and retail sectors, which all seem to have a preference for aquaculture products under special conditions. Seafood and health benefits, and the potential offered new species were seen as driving factors in the aquaculture sector. The opportunities and challenges for the small-scale fish farmers in Southeast Asia were also considered.

The fourth session was fully dedicated to the aquaculture sector in China, with presentations on the domestic market, the export potential, safety and quality inspection and China's role in reprocessing seafood for re-export to the global market.

In the last session on "Progress – The Future", the future developments expected for aquaculture were covered. Here the interaction between capture fisheries and aquaculture was analyzed and also presented in a case study on wild and aquacultured salmon. Aquaculture was viewed within the context of other intensive animal production systems. The enormous potential of the technical innovations in aquaculture compared to capture fisheries was highlighted under the term of "Blue revolution". The last session was closed with a description of the political framework required to allow for the sustainable development of aquaculture.

Arthur, R.; Nierentz, J. (eds).
Global Trade Conference on Aquaculture. Qingdao, China, 29-31 May 2007.
FAO Fisheries Proceedings. No. 9. Rome, FAO. 2007. 271p.

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COURTESY OF INFOYU

Opening of the Global Trade Conference on Aquaculture with participation of the Chinese Government, FAO and the FISHINFONetwork (represented by INFOYU, INFOFISH and GLOBEFISH).

COURTESY OF INFOYU

FISHINFONetwork stand visited by Jochen Nierentz, FAO Senior Fishery Officer, GLOBEFISH; Ichiro Nomuro, Assistant Director-General of the FAO Fisheries and Aquaculture Department; and Chen Shuping, Deputy of INFOYU.

Abbreviations and acronyms

ACC	Aquaculture Certification Council
APEC	Asia Pacific Economic Cooperation
ASEAN	Association of Southeast Asian Nations
AQSIQ	General Administration of Quality Supervision/Inspection and Quarantine of the People's Republic of China
BRC	British Retail Consortium
BSE	bovine spongiform encephalopathy
CAC	Codex Alimentarius Commission
CCPs	critical control points
CITES	Convention on International Trade in Endangered Species
COFI	Committee on Fisheries (of FAO)
CSR	corporate social responsibility
DFID	Department for International Development (United Kingdom)
DDA	Doha Development Agenda (of WTO)
DFO	Department of Fisheries and Oceans (Canada)
DG	Directorate General (of the EC)
DSP	diarrhetic shellfish poisoning
ENGOs	environmental nongovernmental organizations
EC	European Commission
EIA	environmental impact assessment
EU	European Union
EUS	epizootic ulcerative syndrome
FADS	fish aggregation devices
FAO	Food and Agriculture Organization of the United Nations
FOS	Friends of the Sea
FCR	food conversion ratio
GAA	Global Aquaculture Alliance
GAP	good aquaculture practices
GATT	General Agreement on Tariffs and Trade
GHP	good hygienic practices
GFSI	Global Food Safety Initiative
GM	genetically modified
GMOs	genetically modified organisms
GTCA	Global Trade Conference on Aquaculture
HACCP	hazard analysis critical control point system
H/G	high-grade
HPLC	high performance liquid chromatography
HUFAs	highly unsaturated fatty acids
IUU	illegal, unreported and unregulated (fishing)
KHVD	koi herpes virus disease
LC/MS	liquid chromatography/mass spectrometry
LWG	liveweight gain
MBA	mouse bioassay
MRLs	maximum residual limits
MSC	Marine Stewardship Council
NACA	Network of Aquaculture Centres in Asia-Pacific
NGOs	non-governmental organizations

NMFS	National Marine Fisheries Service (United States)
OECD	Organisation for Economic Co-operation and Development
OECD-COFI	Committee on Fisheries (of OECD)
PCB	polychlorinated biphenyl
PSP	paralytic shellfish poisoning
PUFAs	poly-unsaturated fatty acids
QS	quality safety
RFID	radio frequency identification
RSPCA	Royal Society for the Prevention of Cruelty to Animals
RST	Regal Springs Tilapia group
SBM	soybean meal
SOFIA	FAO's State of World Fisheries and Aquaculture
SPS Agreement	Agreement on Sanitary and Phytosanitary Measures
TBT Agreement	Agreement on Technical Barriers to Trade
TS	Taura syndrome
UNEP	United Nations Environment Programme
US FDA	United States Food and Drug Administration
WHO	World Health Organization
WSS	white spot syndrome
WTO	World Trade Organization
WWF	World Wide Fund for Nature

Summary of the Global Trade Conference on Aquaculture

Aquaculture has seen a robust and sustained growth during the last decades. This is foreseen to continue in order to meet the ever-increasing demand for fish, both for domestic food security and for supplying international markets. The role of Asia in general and China in particular as the main producer and supplier is highly impressive, and the trend is likely to continue. This requires particular attention to promote responsible and sustainable aquaculture with strong emphasis on the role of small-scale farmers, who contribute a large share of aquaculture supply.

The forecast growth in aquaculture offers vast opportunities to producers and producing nations, as well as to foreign investors, consumers, retailers, processors and food services. Taking advantage of these opportunities presents several challenges to international organizations, governments, producers, traders and retailers. The key issues are how to make all these stakeholders work together in a coherent manner and how to develop the necessary synergies between the public and private initiatives, policy and governance, industry market forces and nongovernmental organizations (NGOs).

Assuring the safety of aquaculture products remains a fundamental issue for all stakeholders. Other issues such as environmental protection, social protection and animal welfare are gaining more importance for market access. The influence of environmental and social NGO and consumer advocacy groups in shaping consumer perceptions and choices and consequently the sourcing policy of importers, traders, retailers and food services was again and again highlighted during this conference.

Aquaculture has diversified and new species have been domesticated over the last decade. Pilot trials indicate that several more species of finfish, shellfish and bivalve will enter commercial production in the future. Technological development will contribute significantly to improve productivity, yield, quality and consumer acceptability, but consumer acceptability will have a bearing on this future.

Upstream value-addition offers significant opportunities to extract more wealth from aquaculture and create employment opportunities. This will require further care to assure safety, quality and consistency. Retailers and food services are interested in taking advantage of the proximity of production and low labour to outsource value-addition operations to producing nations. It is a win-win situation.

All types of labels, whether quality labels, ecolabels or social labels, are instruments that can convey information and assurance to retailers and consumers. However, they need to "fit the purpose" for which they have seen development, and the certification schemes need to be simple, robust and transparent, so as not to confuse the consumers. Harmonization of standards and equivalence of standards are fundamental.

Better consumer education and communication will improve and balance consumer perception of the benefits/risks. Aquaculture has a great advantage to farm products that will meet nutritional and health aspects and mitigate the risks.

Feed availability and competition for feed from livestock will impact the future of aquaculture. Likewise competition for trash fish and its impact on food security of the rural poor needs careful consideration. Livestock and agriculture by-products may fill the gap for high demand for feeds, but again safety and consumer acceptance need careful consideration. Competition of biodiesel for agriculture by-products can be another development further impacting aquaculture development.

Global warming will no doubt have an impact on aquaculture. The rise in sea level, access to waters and mangrove deforestation are consequences to be considered. Likewise, issues such as food miles/carbon miles/carbon offsets will increase in importance.

Aquaculture and wild fisheries interact in many ways that impact ecosystems, innovations and technology, markets and prices. The challenge is to find the best ways to optimize the positive interactions and mitigate the negative ones.

Development in livestock and poultry farming has interesting lessons for the future of sustainable aquaculture that need to be studied. Aquaculture certainly has advantages that need to be amplified and communicated.

ANNEX 1

Programme

GLOBAL TRADE CONFERENCE ON AQUACULTURE

Qingdao, China, 29 – 31 May 2007

Registration: Monday 28 May, 1700 – 2000 hrs/ Tuesday 29 May, 0800 – 0900 hrs

Tuesday 29 May

09:00 **Opening of Conference**
Mr Ichiro Nomura, Assistant Director-General, Fisheries and Aquaculture Department, FAO
Mr Xue Liang, Chief Economist, Ministry of Agriculture, China

09:30 **Keynote: Driving Forces for Aquaculture – Different Scenarios towards 2030**
Ms Kjersti Gravningen, Director, Pharmaq Asia, Norway
Keynote: Developing Sustainable Aquaculture Industry and Building a Harmonious International Trade Order
Mr Li Jianhua, Director General, Bureau of Fisheries, MOA, China

10:15 Coffee Break

10:30 **Session 1: Aquaculture Growing Strength**
Chair: Mr Ichiro Nomura, FAO

Overview of Production and Trade – the Role of Aquaculture Fish Supply
Mr Jochen Nierentz, Senior Officer, FAO GLOBEFISH
Five Success Stories in Aquaculture
1. Shrimp: The most Valuable Seafood Commodity from Aquaculture
Mr Wally Stevens, Vice President, Global Aquaculture Alliance (GAA), United States
2. Salmon: Production Growth and New Markets
Mr Frank Asche, University of Stavanger, Norway
3. Tilapia: Sustainability by Social and Environmental Commitment
Mr Israel Snir, Vice President for Technology – Regal Springs Tilapia, General Manager - Aquafinca Honduras
Panel Discussion

12:30 Lunch Break

13:30 **4. *Pangasius*: Viet Nam - Fairy Tale of an Unknown Species**
Mr Nguyen Huu Dzung, President, VASEP, Viet Nam
5. Bivalves: Success in a Shell
Mr Douglas McLeod, Chairman of the Association of Scottish Shellfish Growers, United Kingdom
Panel Discussion

14:30 **Session 2: Challenges**
Chair: Mr Lahsen Ababouch, FAO

Safety of Aquaculture Products: Consumer Protection, International Regulatory Requirements and Traceability
Mr Lahsen Ababouch, Chief, Fish Utilization and Marketing Service, FAO

Consumer Assurance: Market-based Quality Schemes, Certification, Organic Labels, Ecolabelling, Retailer Specifications
Ms Melanie Siggs, United Kingdom Director, Seafood Choices Alliance

15:20 Coffee Break

15:45 **Aquatic Animal Health Management in Aquaculture**
Ms Supranee Chinabut, Senior Advisor Fish Diseases, Department of Fisheries, Thailand
Environmental Capacity – Where are the Limits?
Mr Rohana Subasinghe, Senior Fisheries Resource Officer (Aquaculture), FAO
Meeting the Feed Supply Challenges
Mr Albert Tacon, Aquatic Farms Ltd, United States
An Investor's View on Investments and Financing
Mr Björn Myrseth, Marine Farms ASA, Norway
Panel Discussion

17:45 Session expected to end

Dinner reception hosted by the Chinese Ministry of Agriculture

Wednesday 30 May

09:00 **Session 3: Advantages and Opportunities**
Chair: Mr Audun Lem, FAO

Globalization and the Impact on Aquaculture
Ms Lori Ridgeway, Director General, DFO, Canada
Value-added Seafood: Opportunities and Challenges – a United States Restaurant Chain Perspective
Mr George Williams, Vice President, Government & Environmental Affairs, Darden Restaurants, United States
Aquaculture – What Retailers Expect from Producers
Mr Andrew Mallison, Marks & Spencer, United Kingdom
The New Consumer: Seafood and Health Benefits
Ms Linda Chaves, Senior Advisor, Seafood Industry Issues, NMFS, United States

10:30 Coffee Break

10:45 **Aquaculture Production, Certification and Trade: Challenges and Opportunities for the Small-scale Farmer in Asia**
Mr Rohana Subasinghe, Senior Fisheries Resource Officer (Aquaculture), FAO with NACA
Role of New Species - Panel Presentation
Mr Manfred Klinkhardt, Fischmagazin/EUROFISH and Mr Björn Myrseth, Marine Farms ASA
Panel Discussion

12:30 Lunch Break

13:30 **Session 4: China**
Chair: Mr Chen Yide, Deputy Director-General, Bureau of Fisheries, MOA

Domestic Aquaculture Product Market
Mr Chen Lansun, Professor, Shanghai Fisheries University, China
China as an International Supplier
Ms Xiao Fang, Director, Bureau of Fisheries, China
Ecological Aquaculture and Safety Control on Shellfish
Mr Wu Hougang, President, Dalian ZhangZiDao Fishery Group Co., Ltd.

15:15 Coffee Break
15:30 **Aquaculture Seafood Safety and Quality Inspection**
Mr Deqing Zhou, Safety Quality Inspection Control, China
Development of China as the World's Largest Re-processing Centre of Frozen Fish Products and Future Challenges for the Industry
Mr Joo Siang Ng, Managing Director, Pacific Andes Group, Hong Kong, China
Panel Discussion
Chinese Fisheries Information System - presentation by INFOYU
17:15 Session expected to end

Thursday 31 May
09:15 **Session 5: Progress – The Future**
Chair: Mr Jochen Nierentz, FAO
Aquaculture and Fisheries: Complementary or Competition
Mr James L. Anderson, Professor and Chair, University of Rhode Island, United States
Implications of Aquaculture for Wild Fisheries: The Case of Alaska Wild Salmon
Mr Gunnar Knapp, Professor, University of Alaska, United States
Experience in other Food Sectors, Future Lessons for Aquaculture?
Mr Jonathan Shepherd, IFFO, United Kingdom
10:30 Coffee Break
10:45 **Aquaculture – The Blue Revolution**
Mr Manfred Klinkhardt, Editor Fischmagazin/ EUROFISH, Germany
Policy Development for Sustainable Benefit
Ms Linda Chaves ,Senior Advisor, Seafood Industry Issues, NMFS, United States, and Mr Jonathan Shepherd, IFFO, United Kingdom
Panel Discussion

12:00 CONCLUSIONS & FAO VISION
Chair: Mr Lahsen Ababouch, FAO
12:30 Closing Ceremony and End of Conference

ANNEX 2

Opening statements

Ichiro Nomura

Assistant Director-General
Fisheries and Aquaculture Department
Food and Agriculture Organization of the United Nations

Since April 2000, Mr Ichiro Nomura has held the position of Assistant Director-General, Fisheries and Aquaculture Department of the FAO in Rome. Mr Nomura, a national of Japan, holds a B.Sc. in Marine Biology from the University of Tokyo, a Master of Law and Diplomacy from the Fletcher School of Law and Diplomacy, Tufts University, and a Master of Public Administration from the John F. Kennedy School of Government, Harvard University. Mr Nomura's professional career spans a period of 26 years, starting in 1974 at the Fisheries Agency of the Ministry of Agriculture, Forestry and Fisheries in Tokyo in the International Affairs Division, then to the Offshore Fisheries Division, where he was in charge of purse seine fisheries. At the Japanese Embassy in Washington DC, Mr Nomura served as First Secretary in charge of fisheries. Returning to the Fisheries Agency in Tokyo, he was appointed Deputy Director, Fisheries Marketing Division, in charge of fish trade, and Deputy Director of the International Economic Division, in charge of the GATT Uruguay Round agricultural negotiations. Mr Nomura's later positions in the Japanese Fisheries Agency ranged from Deputy Director of the International Affairs Division; Director for International Negotiations; Director, Resource and Environment Research Division; to Director, Far Seas Fisheries Division, where his main responsibilities included administering Japan's long-distance fishing fleet. Mr Nomura was well known in various international fisheries fora, including the FAO Committee on Fisheries, the FAO Compliance Agreement Negotiation, the UN Fish Stock Agreement Negotiation, the Commission for Conservation of Antarctic Marine Living Resources and the International Whaling Commission. He also served as Chairman of the Organisation for Economic Co-operation and Development (OECD) Committee on Fisheries and Chairman of the International Commission for Conservation of Atlantic Tuna.

Opening statement

Ichiro Nomura
Assistant Director-General
Fisheries and Aquaculture Department
Food and Agriculture Organization of the United Nations

Your Excellency, Mr Xue Liang, Chief Economist, Ministry of Agriculture,
Distinguished Representatives and Participants,
Ladies and Gentlemen, Colleagues,

For the first time the FAO Fisheries and Aquaculture Department together with the FISH INFONetwork has taken the initiative to cover the topic of aquaculture trade in an international conference foreseen to bring the perspectives of industry, governments, science, consumers, retailers and nongovernmental organizations (NGOs) together. It is a pleasure for me, as the Assistant Director-General of the Fisheries and Aquaculture Department, to extend to you all a warm welcome to this Global Conference on Trade in Aquaculture, on behalf of the Director-General of FAO, Dr Jacques Diouf.

Preparation for this important event was a collaborative effort between the Ministry of Agriculture of the People's Republic of China, The Department of Fisheries and Aquaculture in FAO and the FISH INFONetwork, in particular INFOFISH and INFOYU. I greatly appreciate the very valuable support of the Chinese Ministry of Agriculture, and particularly from the Bureau of Fisheries and its Society of Fisheries. The Chinese Conference Steering Committee and Secretariat, under the leadership of Mr Fan Xiaojian, Vice Minister of Agriculture, have invested valuable time and efforts to promote the event in China and prepare for it, and I am very grateful for this.

In 1996, FAO assisted China to set up the special Information Unit INFOYU as part of the Fisheries Society through a Technical Cooperation Project in the Ministry of Agriculture, Bureau of Fisheries. I am happy to see that this office has developed to a very useful link in the FISH INFONetwork, and as we will see on Wednesday, has started with an international news service, covering the most important fisheries and aquaculture nation for the world.

I should also mention the other FISH INFONetwork members, in particular INFOFISH, which handled the administration and promotion of the conference and GLOBEFISH, our in-house Marketing Information Service in the Fish Utilization and Marketing Service. I have been asked by the members of the FISH INFONetwork, which are all former FAO regional projects, to welcome you also in their name to this conference.

As you already may be aware, the title of the Department was changed from the Fisheries Department to the Fisheries and Aquaculture Department as of 1 January 2007. This can be interpreted that we intend to put more priority on responsible aquaculture, whose contribution to global supplies of fish and fisheries products continues to grow. This conference is part of these efforts and as a next step, the results of our discussions will be used in November when all 190 member countries of FAO come together in Rome at the FAO Conference, where the role of aquaculture in sustainable development has been proposed as one topic.

I shall also highlight the importance FAO has accorded to trade and aquaculture – importance that is reflected in the creation of two fora – the Committee on Fisheries (COFI) Sub-Committee on Fish Trade and the Sub-Committee on Aquaculture. These two

fora enable FAO Members to gather every two years to discuss the major global issues for the promotion of responsible aquaculture and trade.

Distinguished Representatives and Colleagues, facts and figures show a clear picture – as we will see in detail later today – of the important role aquaculture is playing in seafood production, as well as the challenges it puts on the environment, consumer safety and last but not least, on capture fisheries. Aquaculture growth is distributed unequally over the globe, a fact to be analyzed carefully to be able to give technical and policy guidance to ensure that the growth is sustainable with due recognition of both ecosystem issues as well as the urgent needs of poverty eradication and food security. We are all aware that capture fisheries and aquaculture provide a major contribution to global food security, both directly, as a source of food, income and employment and indirectly, as a source of meal and oil for animal feed.

As fish trade gets further globalized and out-processing develops further, the issue of certification of production and processing methods and products is becoming crucial to ensure, on one hand, consumer and environmental protection and transparent processes, and fair trade practices on the other. In this respect, FAO has been tasked to develop international guidelines for certification in aquaculture, and you will be informed of the course of actions undertaken to achieve this.

Ladies and Gentlemen, FAO's mandate is to raise levels of nutrition, improve agricultural productivity, better the lives of rural populations and contribute to the growth of the world economy. Four main areas of activities are identified:

- putting information into reach,
- sharing policy expertise,
- providing a meeting place for nations, and
- bringing knowledge to the field.

To fulfil its mandate, FAO strives to be proactive and will have to work with all stakeholders. The Fisheries and Aquaculture Department has been quite innovative and open-minded by trying to listen closely to the opinions, knowledge and expectations of the seafood industry and to the NGOs, in addition to its member countries. This year we already had organized the FAO/OECD Workshop on Globalization and met with the NGOs during the Committee of Fisheries. We actively support the FISH INFONetwork in their commodity conferences on organic aquaculture, tuna, shrimp, bivalves, tilapia and catfish later this year, which are important meeting points for the industry and decision-makers.

We recognize that fisheries and aquaculture, due to the internationalization of a sector where nearly 38 percent of its catches are traded, is not any more only the domain of biologists, fishing experts and processors, but is strongly influenced by clear economic factors along the value chain through retailers, the food-service sector, the regulatory framework, technological innovations, consumers' perceptions and expectations, and NGOs' advocacy agendas, and in all those areas aquaculture has advantages compared to capture fisheries.

With this short provocative statement I want to hand over the opening to the distinguished Vice Minister Fan Xiaojian, whose Ministry secured this conference here in the "romantic" city of Qingdao where we will also have the chance to get a glimpse of the fantastic variety of seafood in the Chinese cuisine.

I wish you a very fruitful conference that should help us and other stakeholders to have a positive impact in the aquaculture sector. I wish you well in your deliberations and thank you very much for your attention.

Opening statement

Xue Liang
Chief Economist
Ministry of Agriculture
China

Respectable Mr. Ichiro Nomura, Assistant Director-General for Fisheries, Food and Agriculture Organization of the United Nations;
Distinguished Guests, Ladies and Gentlemen:

Good morning! The First Global Trade Conference on Aquaculture (GTCA), jointly sponsored by the Food and Agriculture Organization of the United Nations (FAO) and Chinese Ministry of Agriculture, is officially opened in Qingdao, a beautiful coastal city of China. On behalf of Mr. Fan Xiaojian, Chairman of China's Organizing Committee of the GTCA, I would like to express my warm congratulations on the convocation of this conference and to extend my warm welcome to all the participants present here today.

The rapid development of global aquaculture and trade prompted the convening of this conference. With the theme of "Sustainable Development of Aquaculture and Trade Globalization", many world-famous scientists and elites of the business circle have been invited to deliver speeches in such areas as aquaculture, value-added processing, quality safety, market prospects, trade cooperation etc. This conference is of great importance to China's fishery, and it provides us a precious opportunity to learn more from each other, so that it is bound to accelerate the restructuring of China's fishery and promote the transformation of the growth mode, as well as upgrade the industrial quality. Hereby, on behalf of the Chinese Ministry of Agriculture, I'd like to express once more our warm welcome and sincere appreciation to all speakers present at the conference.

Ladies and Gentlemen, the major problems we face in the twenty-first century are population, food, energy and environment, which are of vital importance to human existence and development. Solving the problems facing agriculture, rural areas and farmers and ensuring food safety remains the common task of all developing countries. Over the past 20 years of China's reform and opening-up to the world, we have achieved the basic goal of keeping a balance between supply and demand. However, ensuring food security will continue to be an arduous job for a big country with a population of 1.3 billion. The Chinese Government has attached great importance to fishery development, which is a very important element of agriculture and the main source of animal protein. In order to maintain the sustainable development of the coastal fishery, people are encouraged to be engaged in ocean and inland waters exploration in the light of the breeding-dominant policy established in mid-1980s. In the past 20 years, China has made remarkable achievements in aquaculture. By 2006, the area for aquaculture has expanded to 7.79 million ha and the output is 35.94 million tonnes, which contributes to the market supply, ensuring food security, readjusting the industrial structure in rural areas, and increasing job opportunities and the income of farmers and fishermen, as well as expanding the international trade of aquatic products. Last year, China's trade in aquatic products reached a total volume of US$ 13.66 billion. China's fishery has grown by leaps and bounds thanks to China's reform and opening-up policy, the breeding-dominant principle and the entry into the World Trade Organization (WTO) for global trade cooperation.

Aquatic products for international trade, and aquaculture products in particular, are now mainly produced by developing countries, which is a positive contribution made to global trade of aquatic products and food security. Meanwhile, trade of aquatic products also promotes the economic growth and industrial improvement of developing countries. However, the current trade development is still facing quite a number of major problems that need to be resolved, such as market access, food safety, technology standards etc. Therefore, it's an important task for governments and enterprises across the world to establish an international order for trade in aquatic products, which is beneficial to exporting and importing countries of aquatic products, meeting the diverse consumption demand and protecting resources and the environment, as well as ensuring the world's food security and sustainable development. In light of seeking common ground while resolving differences, we should retain our common interests in fisheries and handle the divergences and our common concerns in an appropriate way. We should keep an eye on the future development of mankind and jointly promote the sustainable development of global aquaculture and trade on the basis of equality, mutual benefit and win-win cooperation.

Ladies and Gentlemen, as China's economy is continuing to grow at a great speed and there is a big potential in production and market, we have seen a broader prospect for our future cooperation with foreign countries in terms of fishery economy, technology and trade. With the scientific view of development as our guiding principle, we are striving to transform our mode of growth in fisheries and pursue a harmonious and sustainable development between man and nature. I sincerely welcome all friends to visit China and put forward more valuable suggestions and advice for the advancement of China's fishery.

I'd like to express my gratitude to FAO for choosing China as host for the first Global Trade Conference on Aquaculture, as well as to all fishery organizations at home and abroad, institutions and individuals for their help. My special thanks go to INFOFISH and the Secretariat of China's Organizing Committee for their efforts that have made this conference possible.

In closing, I wish for a successful conference and wish you all a pleasant stay here in Qingdao.

Thank you all.

Keynote presentations

Kjersti Gravningen

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Kjersti Gravningen, a microbiologist from the University of Oslo, holds a Master of Management from the International School of Business Administration in Oslo. She started her aquaculture career by working with the larval rearing of marine fish and then transferred to fish health management in 1991. Ms Gravningen has extensive experience in global fish health management and disease prevention. Her key areas of expertise include the development, testing and implementation of vaccines and vaccination regimes in fish. Since 1991, she has held several positions within Alpharma Aquatic Animal Health, Research and Development and Business Development, until the aquatic business unit was established as PHARMAQ in 2004. Ms Gravningen has developed different scenarios for future commercial aquaculture as a part of the scenario programme at the International School of Business Administration in Oslo.

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Driving forces in aquaculture – different scenarios towards 2030

Kjersti Gravningen
PHARMAQ AS
Oslo, Norway

ABSTRACT

During the past decades, the aquaculture industry has expanded, diversified, intensified, integrated and made technological advancements. According to FAO's statistics, aquaculture's contribution to the global supply of fish continues to grow, increasing from 9.3 percent of total production (excluding aquatic plants) in 1985 to 34.1 percent of total production in 2005. The production from aquaculture has almost doubled during the past ten years, increasing from 24.4 million tonnes in 1995 to 48.1 million tonnes in 2005. At the same time, the production from capture fisheries has stabilized at approximately 93 million tonnes. The world's population is projected to grow from six billion in 1999 to nine billion by 2042, an average annual increase of 69 million people. Given this population growth, stable consumption per capita and a stable production from capture fisheries of 95 million tonnes, the aquaculture sector will need to supply 89 million tonnes in 2030. Aquaculture production would thus be greater than capture fisheries in 2035. Important factors with assumed future impact on the aquaculture industry towards 2030 include climatic changes, environmental issues, access to sites and water, raw material supply for feed, pandemics and fish health management, integration and ownership structures, food safety and traceability. The forces with high impact and a high level of uncertainty are presented as a basis for some future scenarios for aquaculture.

INTRODUCTION

During the past decades, aquaculture has expanded, diversified, intensified, integrated and made technological advancements. Although production from aquaculture doubled from 24 million tonnes in 1995 to 48 million tonnes in 2005, the percentage annual growth rate has since slowed down. The production from capture fisheries has stabilized at approximately 93 million tonnes (FAO fishstat +[1]). The world population increases by around 77 million annually and is projected to reach 9 billion by 2042 (United States Census Bureau 2007). The production of fish per capita in 2005 was 22 kg. Assuming stable production per capita and stable capture fisheries, the future projections indicate that aquaculture production will need to supply 89 million tonnes in 2030.

This study uses scenario planning, a technique that attempts to capture a whole range of possibilities by using joint impact of various uncertainties to create future scenarios. Scenarios are mental pictures of future worlds, formulated into focused stories that can be used to make us aware of the possible changes, challenges and opportunities that the future may hold. Scenario planning differs from other methods, such as contingency planning and sensitivity analysis, in that it explores the impact of several uncertainties

[1] All numbers used represent total production excluding aquatic plants.

that change simultaneously and often includes elements such as the impact of new regulations and value shifts that cannot be formally modeled (Schoemaker 1995).

MATERIALS AND METHODS

The scenario focus of this study was "what commercially interesting species will be produced in 2030 and in which countries will they be produced?". A deductive scenario structuring method was used (Van der Heijden 1996). The driving forces were identified and ranked based on the uncertainty and the impact on the scenario focus. The two top independent driving forces with high impact and high uncertainty were selected as the basis to establish the scenario cross, resulting in four different scenarios. The data were collected through interviews with experts in the different areas and a literature search.

The study includes finfish only. The fish groups used as the basis for the scenario development were "High-value fish species"[2] and Tilapia[3]. The 2005 numbers are FAO fish stat+ numbers for the respective groups.

RESULTS

Driving forces with high impact on the aquaculture industry

The important driving forces in this study relate to technology, politics, society, environment, globalization and financial aspects. The driving forces selected were climatic changes, endemics and fish health, management, raw materials for fish feed, food safety, access to sites and water, integration, global ownership, environmental impact, implementation of transgenic fish and nanotechnology.

Climatic changes

Over the past four decades, sea temperatures of the North Sea have risen by about 1 °C and by 2100, are predicted to further rise by 1.1° to 4.6 °C (relative to 1990). The consequences of this include rising sea level, with impacts on marine ecosystems, fisheries and aquaculture, as well as epidemic diseases and harmful algal blooms (Epaedia 2007). The warming will impact on the diversity and quantity of species. The effects will probably be most dramatic around the equator, where aquaculture may become difficult.

Increasing and less predictable extreme weather conditions such as drought, floods, storms and typhoons will affect both freshwater and marine aquaculture. These climatic changes may affect the world fisheries and aquaculture even more than overfishing.

Epidemics and fish health management

Fish products are transferred frequently around the world. Transfer of eggs, fry and brood fish increases the risk of disease transfer. The most striking example of spread of disease and major loss in aquaculture is white spot disease in farmed shrimp. The disease emerged in 1991/92 in Taiwan Province of China and by 2000 had spread to all shrimp-producing countries in the world. The global estimate of economic loss due to this disease is US$ 3 billion per year (Hill 2001). The introduction of new farmed species, farming of multiple species, intensification of rearing and environmental changes will increase the probability of new diseases. Epidemics with broad host range may be a threat for the future.

Vaccination is common practice in salmonid-farming countries. In Norway, vaccination has dramatically reduced the use of antibacterials from almost 1 kg per tonne in 1987 to almost nothing (FAO 2006). The development of effective vaccines has

[2] ISSCAP groups: Cod, hakes and haddocks; Flounders halibuts and soles; Sturgeons and paddlefishes; Tunas, bonitos and billfishes; Misc. coastal fishes; Misc. pelagic fishes; Salmons, trout and smelts (numbers from FAO Fishstat + 2005).

[3] ISSCAP group: Tilapias and other cichlids.

made a great contribution to the sustainability of salmon farming by reducing mortality, improving the food conversion ratio (FCR), and reducing the use of antibiotics and the possibility of developing antibiotic resistance. Further development of vaccination strategies, prophylactic treatments, probiotics and immunostimulants is expected. Implementation of improved fish health management is driven by technological advancement, regulations and consumer demand for safe and healthy food.

Raw materials for fish feed

The International Fishmeal and Fish Oil Organisation (IFFO) anticipates that the production of fish oil and fish meal will stabilize over the next 10 years. The proportion of fish oil used in aquaculture has increased from 18 percent in 1995 to 80 percent in 2005. The proportion of world fishmeal used by aquaculture was 15 percent in 1995 and 50 percent in 2005 (Kilpatric 2003, E. Wathne personal communication 2007). In addition, 7.3 million tonnes of by-catch is discharged every year (FAO 2004). Technologies are being developed to reduce by-catch, but it is also a political task to harmonize and properly manage the regulations on quotas for fishing.

The supply of raw marine materials for fish feed relative to the predicted future increase in production is critical. If the production of carnivorous fish species increases, alternative technologies must be developed. Captured zoo- and phytoplankton may be an alternative source of high-quality oils and proteins. Vegetable proteins and oils can partly replace the marine sources; however, the quality and fatty acid profile of farmed fish fed such products may be altered. There may also be potential to use bioproteins produced by methanothropic bacteria from natural gas (Mydland, Frøyland and Skrede 2007).

Food safety

The consumer and retail industries' focus is on healthy food, free of residuals and accumulated heavy metals. Requirements in regard to quality and traceability of all food ingredients apply throughout the value chain. Several cases of unauthorized residues were reported in the months previous to the writing of this article: the chemical compound melamin was detected in fish feed, Japanese inspectors found several kinds of banned antibiotics in imported seafood, and Alabama banned imported catfish due to flouroquinolones. Such incidents are bad for the reputation of the entire industry and further strengthen the focus of consumers on food safety and traceability. Food safety will be even more important for the future, and functional food will also play a key role.

Access to sites and water

Water is essential for all processes. State and private bodies are increasingly aware of water as a finite resource that needs to be used efficiently to satisfy the global demands. Freshwater aquaculture is not a large consumptive user of water, as the water is ultimately returned into the system. However, the water quality may be modified, particularly in areas with intensive production. Conflicts may arise where there is a strong local competition for water supply.

Two-thirds of the earth's surface is seawater. The use of marine waters faces competition from fisheries, tourism, urban development and the conservation of biodiversity. There are almost unlimited exposed marine areas available for aquaculture. The technology for exposed off-shore production capable of withstanding typhoons and storms is being developed.

Integration, global ownership

The past 20 years have seen extensive consolidation of the aquaculture industry. In 1985, small family companies produced 26 000 tonnes of salmon. In 2007, Marine Harvest controls 30 percent of the world's production of 1.6 million tonnes (Cherry

2007). In Viet Nam, the top four processing plants controlled 35 percent of the 286 000 tonnes of catfish fillets that were exported in 2006 (Viet Nam General Department of Customs 2007). Currently, the salmon-producing companies are entering the tilapia industry. One of Chile's largest suppliers of salmon controls 45 percent of the tilapia farming in Costa Rica (Baklien personal communication 2007). The horizontal and vertical integration of the aquaculture industry is likely to continue towards 2030 and is expected to impact on industrialization as well as technology development.

Environmental issues

Aquaculture production can cause environmental problems by pollution of waters, antibiotic resistance, genetic pollution and utilization of energy. Last year an estimated 790 000 salmon (0.35 percent) escaped from Norwegian fish farms. The escaped farmed fish might interbreed with wild stocks (Vulliaume 2007). Farm escapees are a growing concern among fish farmers, environmentalists and authorities alike. The extensive use of legal and illegal antibacterials in many areas can lead to the development of strains of resistant bacteria. This resistance could ultimately be transferred to bacteria that pose a threat to humans. There is also a risk of accumulation of chemicals in sediments surrounding aquaculture operations.

Some positive developments have also occurred: the feed conversion rate has more than halved since the salmon industry emerged, and the industry's discharge of nitrogen has decreased by about 80 percent (E. Wathne personal communication 2007).

The environmental impact of aquaculture is strongly related to other factors such as climate change, management, fish welfare, traceability and food safety. As with all other industries, the aquaculture industry should focus on the environment, and the impact of aquaculture on the environment will be subject to even closer scrutiny in the future.

Implementation of transgenic fish

Transgenic fish are fish that have foreign DNA that has been artificially inserted into their genome. More than 20 species of finfish have been genetically modified to produce selected traits: increased growth, improved feed conversion, cold tolerance and disease resistance. Transgenic tilapia have been reported to grow four times faster than non-transgenic siblings. A number of antimicrobial peptides have potential to improve disease resistance. A key enzyme (n-6 desaturase) that may help fish in converting plant proteins to omega 3 fatty acids (EPA and DAH) has been identified (Rasmussen and Morrissey 2007).

The technology has already been developed; however, it is highly questionable if, how and when it will be fully implemented. Concerns include human safety issues – that transferred genes may maintain allergenic or toxic properties, that transgenic proteins may continue to possess bioactivity following consumption or that disease-resistant fish may become hosts for new and more serious pathogens. The main environmental concerns include the potential impact that escaped transgenic fish may have on natural biodiversity, with transgenics out-competing or cross-breeding with natural populations. The economic concerns are that surveys indicate that buyers (particularly outside the United States) have a negative perception of genetically modified (GM) foods (McLeold *et al.* 2006).

Transgenic fish must be approved by the regulatory authorities. No product has until now been approved, and several regions around the world have banned GM products (McLeold *et al.* 2006). Thus, the implementation of transgenic fish is highly uncertain.

Nanotechnology

Nanotechnology is an interdisciplinary science covering biosciences and material sciences, among others. As with all other industries, aquaculture will be affected by

this development. Carbon nanotubes are currently used in several other industries. The material is 300 times stronger than steel. There are also nano materials with anti-algal and anti-bacterial effects. Such materials could be highly beneficial for the aquaculture industry.

Tracking nano sensors are being developed. "Smart fish" may be fitted with sensors and locators that relay data about their health and geographical location to a central computer. Such technology may be used to control cognitive cage systems or individual fish (ETC Group Report 2004). Nanotechnology may provide solutions for targeted delivery of medicines to fish. Nanotechnology may also increase the absorption of nutrients. Scientists from the Russian Academy of Sciences have reported that young carp and sturgeon exhibited a faster growth rate (30 and 24 percent, respectively) when they were fed nanoparticles of iron (ETC Group Report 2004). Nanotechnology will thus be a strong driver for development of cognitive cage systems, pharmaceuticals, materials and communication.

Scenario cross

All of the above mentioned driving forces have high-impact potential on the future. The most uncertain forces are:

- raw materials for fish feed,
- implementation of transgenic fish, and
- nanotechnology.

Nanotechnology interacts with both transgenic fish and with fishfeed raw materials. Implementation of transgenic fish and the fishfeed raw materials are selected for the scenario cross.

Raw materials for fish feed: the vertical axis depends on capture fishery and technology development. At one end of the scale fisheries resources are heavily exploited and there will consequently be no fish products used for fishfeed production, either due to political or biological reasons (Figure 1). If high-value fish species are

FIGURE 1

Four scenario pictures generated from the high-impact uncertain driving forces. Availability of fish feed raw materials, and implementation of transgenic fish. The four scenario pictures are called "Banning policies, Green revolution, Diversification and the Big five".

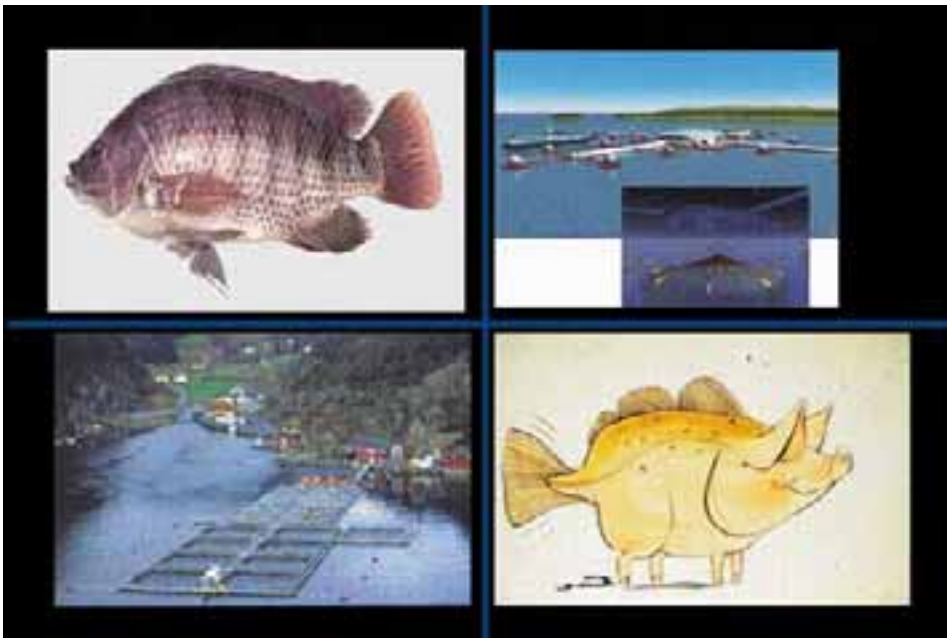
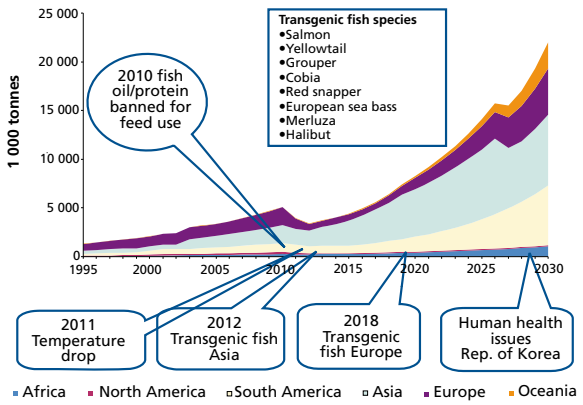


FIGURE 2
Development of high value fish species in different regions of the world, in the Green revolution scenario



to be produced, cost effective alternative sources for fish feed must be developed. At the other extreme, capture fisheries stabilize at current levels.

Implementation of transgenic fish: the horizontal axis will be influenced by the perceived environmental and consumer safety and regulations. At one extreme of the scale, transgenic fish will not be accepted. In the other extreme, transgenic fish are well perceived (Figure 1).

This cross generates four different future scenarios, which I have named; Banning policies, Green revolution, Diversification and the Big five (Figure 1). Only the Green revolution and the Diversification are presented below.

The scenario story "Green revolution"

In 2006, the industry was in very good condition. The market acceptance was generally good. However, cadmium was detected in fishmeal used for fish feed in Norway. This was three years after the polychlorinated biphenyls (PCBs) and dioxin discussion in farmed fish. The World Health Organization (WHO) banned the use of fish-based raw materials in fish feed in 2010 (Figure 2).

The captured production was stable until 2009; however, wild species contained levels of contaminants above recommendations from WHO. In 2011, global temperatures increased, resulting in the ice on Greenland melting and the slowing and eventual change in direction of the Gulf Stream. The diversity and quantity of captured fish dropped by 30 percent. Aquaculture production declined by 40 percent in the North Atlantic. Due to great need of healthy food rich in omega-3 fatty acids, the first transgenic fish were introduced in Asia in 2012. The drivers for transgenic traits were consumer and environmental acceptance. The fish were sterile, resistant to diseases, utilized vegetable proteins and oils, and were rich in omega-3 fatty acids. This, together with the presence of contaminants in wild stocks, meant that the discussions on interbreeding and human health concerns never took off.

High-value fish species are produced in cognitive submerging cages. The self-automated free-floating systems continuously report the feed conversion, fish welfare status and environmental conditions to databases that are assessed by producers, retailers, authorities and consumers. When typhoons or toxic algal blooms are predicted, the system automatically relocates itself to a safe location. The eight different high-value transgenic fish species (Figure 2) represent 95 percent of all high-value fish produced. Three vertically integrated companies own and control the production globally. The production in the European Union (EU) has declined, as the EU was the last to implement transgenic fish in 2018.

In 2026, the young generation in the Republic of Korea, which eats much fish, develops symptoms of reduced fertility rate. The cause has not been clarified, however people are concerned. The production of high-value transgenic species drops. The production of high-value fish species in 2030 is 22 million tonnes, lead by Asia and South America.

The concern about transgenic food in 2026 boosted the production of non-transgenic tilapia, whose production reached 33 million tonnes and was lead by Asia and Africa (Figure 3).

The scenario story "Diversification"

The escape of illegally used transgenic salmon from Canada into Alaskan rivers in 2010 was the driver behind the implementation of strict regulations on transgenic fish and an eventual global ban of the use of transgenic fish in aquaculture. Capture fisheries maintains a stable level, and the growth rate for marine aquaculture is highest in Latin America and Oceania due to control of the majority of the wild catch.

New fish-farming clusters are established in the Middle East and the Russian Federation, where gas is used for production of proteins. Some "carnivorous" species were adapted to vegetable-based diets and although these fish lack the high-value fatty acids, the marketing of a low fat product was successful. Global warming led to extreme temperatures around the equator, species were eradicated and the fish farming moved towards the poles. In Europe, species such as sea bass and snappers are produced on rebuilt oil-platforms in the Barents Sea. Tuna broodstock were fed on fish diet only: consequently a prion disease occurred in 2028. Fortunately, the brood fish were kept in a closed system and the entire population was eradicated without further spread. The diversity of different high-value species and technologies is great, with 200 high-value species produced commercially to a total volume of 17 million tonnes in 2030 (Figure 4). The retailers complain about the logistics.

Tilapia was adapted to thrive in seawater and out-competed the native fish, resulting in dramatic changes in the diversity of wild fish in the affected areas. In 2017, Asia suffered from drought and freshwater became heavily polluted, which caused a 70 percent mortality in all freshwater production. Tilapia production suffered from global warming; however, in 2030 the industry is recovering and the total production of tilapia is 15 million tonnes (Figure 5).

Diseases cause losses in all operations. New advanced technologies for vaccines are available; however, the high diversity of species and lack of harmonization of

FIGURE 3
Development of tilapia in different regions of the world, in the Green revolution scenario

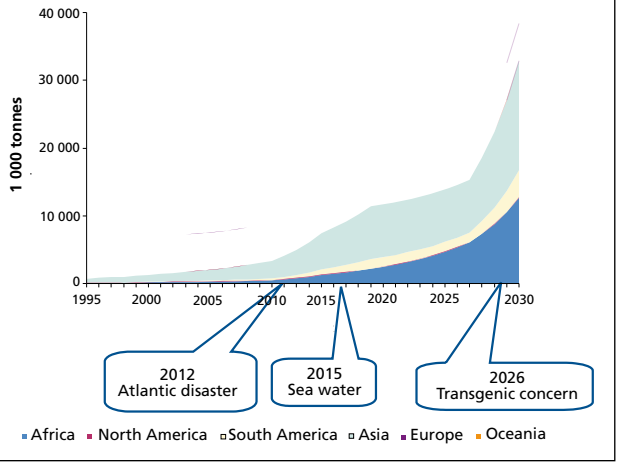


FIGURE 4
Development of high value species in the different regions of the world, in the Diversification scenario

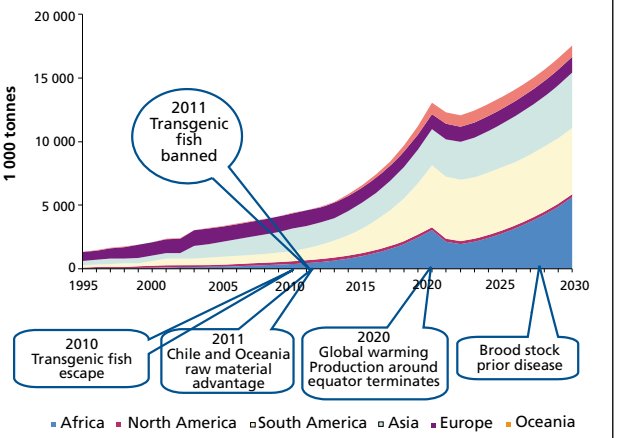
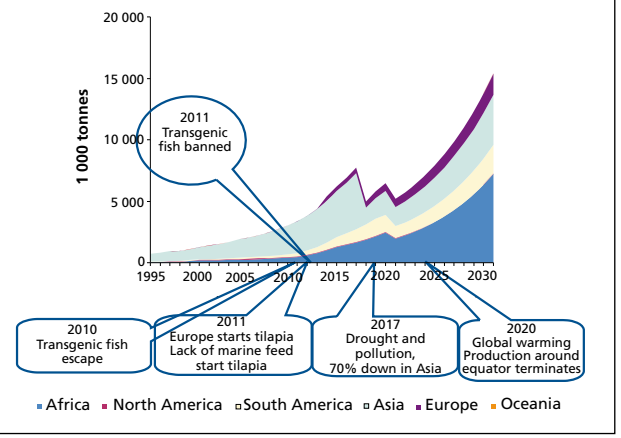


FIGURE 5
Development of tilapia in the different regions of the world, in the Diversification scenario



regulatory requirements make it difficult to bring efficacious products into all market segments. Antibacterials are heavily used.

DISCLAIMER

The above scenarios are prepared based on creative sessions that attempt to take account of a whole range of possibilities and the joint impact of various uncertainties. These scenarios are not facts, but rather some thoughts on what might happen in the future. Scenarios can be used to make us aware of the possible changes, challenges and opportunities that the future may hold, thus helping to prepare us for the future.

REFERENCES

Cherry, D. 2007. The person of the year 2007. *Intrafish*, 5(5): 30–39.

ETC Group Report. 2004. Down on the farm: the impact of nano-scale technologies on food and agriculture. (Available at http://www.azonano.com/Details.asp?ArticleID=1331)

Epaedia. 2007. Environment explained, sea temperatures relevance. (Available at http://epaedia.eea.europa.eu/galleryhere).

FAO fishstat +. (Available at http://www.fao.org/fi/website/FIRetrieveAction.do?dom=topic&fid=16073&lang=en)

FAO. 2004. New data show sizeable drop in numbers of wasted fish. *(*Available from http://www.fao.org/newsroom/en/news/2004/50302/index.html)

FAO. 2006. State of the world aquaculture. (Available from http://www.fao.org/docrep/009/A0699e/A0699e00.htm)

Hill B.J. 2001. International trade in farmed fish and shellfish: the impact of disease spread. (Available at http://www.agriculture.de/acms1/conf6/wsfish.htm))

Kilpatric J.S. 2003. Fish processing waste – opportunity or liability? *Infofish International,* 5: 34–40.

McLeold, C., Grice J., Campbell, H. & Herleth, T. 2006. Super salmon, the industrialisation of fish farming and the drive towards GM technologies in salmon production. (Available at http://www.conversations.canterbury.ac.nz/documents/Salmon%20Report.pdf)

Mydland, L.T., Frøyland, J.R.K. & Skrede A. 2007. Composition of individual nucleobases in diets containing different products from bacterial biomass grown on natural gas, and digestibility in mink (*Mustela vison*). J. Animal Physiol. Animal Nutr. (OnlineEarly Articles). doi:10.1111/j.1439-0396.2007.00674.x

Rasmussen, S. & Morrisey, M.T. 2007. Biotechnology in aquaculture, transgenics and polyploidy. *Comprehensive Reviews in Food Science and Food Safety,* 6: 3–16.

Schoemaker P.J.H. 1995. Scenario planning: a tool for strategic thinking. *Sloan Management Review,*Winter, pp. 25–40.

United States Census Bureau. World population information. (Available at http://www.census.gov/ipc/www/idb)

Van der Heijden, K. 1996. *The art of strategic conversation*. John Wiley and Sons, United Kingdom, 196 pp.

Viet Nam General Department of Customs. 2007. *Pangasius* exports in 2006. *Vietfish*, 4(1): 27.

Vuillaume, W. 2007. Escapes from Norway's fish farms threaten wild salmon. (Available at http://www.terradaily.com/reports/Escapes_From_Norways_Fish_Farms_Threaten_Wild_Salmon_999.htm)

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Developing sustainable aquaculture industry and building a harmonious international trade order

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ABSTRACT

In the past 20 years, a China-characterized path for fishery development has been set up by the Chinese Government, based on the fish farming-focused principle. Driven by the development of aquaculture, Chinese traditional fishery has been greatly improved. This contributes not only to the income of fishers and relieves pressure on marine resources, but also assists global food security and world fish trade. Facing both challenges and opportunities, the aquaculture and fisheries sectors need strategically to strengthen international cooperation, which is supposed to drive global aquaculture development in a more sustainable way and ensure the fish supply. In China, fair, orderly and harmonious trading policies and regulations have been proposed and emphasized by the government to provide more effective direction and ensure better resource management and an environmentally friendly, high-quality and trade-harmonious aquaculture development system.

INTRODUCTION

Distinguished Chairman, Distinguished Guests, Ladies and Gentlemen,
It is my honor to deliver a keynote speech at the conference. My topic is "Developing Sustainable Aquaculture Industry and Building a Harmonious International Trade Order". I would like to explain it from the following three aspects:

SUSTAINABLE DEVELOPMENT OF THE AQUACULTURE INDUSTRY IN CHINA AND ITS CONTRIBUTION TO INTERNATIONAL TRADE

China has a long history of aquaculture. During the Tang Dynasty (618–907 AD) some 1 200 years ago, the culture of four major fish commonly consumed in China (i.e., grass carp, silver carp, black carp and bighead carp) had reached a certain scale. Twenty-two years ago, China issued the Fisheries Law, in which it laid down the guidelines for fisheries development as aquaculture-based fisheries. The enactment of the Fisheries Law was an important turning point for fisheries development in China, as it clearly indicated that China had shifted its focus for fisheries development from the fishing industry to aquaculture. In 1988, the output of China's aquaculture surpassed that of its capture fisheries for the first time. Over the past 20 years of development, China's aquaculture industry has made brilliant achievements. By 2006, the output of aquaculture accounted for 68 percent of the total output of aquatic products in China,

and the fisheries population engaged in aquaculture was 13.06 million. A great number of farmers have shaken off poverty and become rich through taking up aquaculture.

The sustainable development of China's aquaculture industry lays a solid foundation for expanding trade in aquatic products. During the 20 years from 1985 to 2006, the export volume of China's aquatic products increased from 120 000 tonnes to 3.01 million tonnes, and their export value increased from US$ 270 million to US$ 9 360 million. At present, there are more than ten aquaculture species that have achieved a certain export scale in China. Among them, the annual export value of prawns and eels has reached more than US$ 800 million and $700 million, respectively. The contribution of aquaculture to China's aquatic products approximates 50 percent.

We can summarize the experience in developing international trade in China's aquaculture products over the past 20 years as follows:

Developing aquaculture by making progress in science and technology

To develop international trade in aquaculture products, we must select advantageous aquaculture species and areas for intensive development according to the demands of the international market. In addition, we should surmount the key technological difficulties in the breeding and culture of fry, strengthen selection and breeding, and introduce and promote improved species, as well as improve our ability to control aquatic animal diseases through progress in science and technology. In the 1980s, Chinese scientists and researchers overcame the difficulties in artificial breeding and developed high-yield aquaculture techniques for Chinese prawns and solved the difficulties in high-yield aquaculture techniques for European eels. These two species, Chinese prawns and European eel, have become the important species for the export of aquatic products. At the end of the 1990s, China focused on large-scale aquaculture technology for tilapias to meet the demand of fillet processing. In doing so, China can partially supply the tilapias for the international market.

Promoting the layout of advantageous regions and improving their development potential

In recent years, the Ministry of Agriculture has taken an integrated approach in terms of resources, environment, market demand, production scale, location advantage, industry foundation etc. according to the natural conditions and local production features in China. In addition, it also actively improves the establishment of regional layout for advantageous aquatic products, optimizes the allocation of resources, gathers talents, strengthens the improvement of infrastructure, attracts social investment and improves production conditions. Furthermore, it strives to advance standardized production and management, as well as promote healthy aquaculture. All the above measures that the Ministry of Agriculture has taken promote the development of an effective and high-quality aquaculture industry, as well as its foreign trade.

Enhancing the quality and safety of aquaculture products and providing safe raw materials

In recent years, the Chinese Government has attached great importance to the quality and safety management of aquatic products and is constantly improving relevant laws and standards. It is also taking the following measures:

- strengthening the quality and safety management system for aquaculture by intensifying drug residue monitoring and management and taking stern actions against violators of laws and regulations concerning drug use;
- promoting origin identification and product certification, introducing export inspection and a traceability system, and supervising the record of exporting raw materials base;

- strengthening aquatic environmental monitoring, developing methods for safety evaluation and the risk assessment of veterinary drugs, and accelerating research and development for new veterinary drugs and vaccines; and
- reinforcing training for popular science education, promoting healthy aquaculture techniques and training new-type fishermen in aquaculture.

Through concerted efforts, China's ability to control drug residues in aquatic products has been strengthened and aquaculture enterprises have gradually established good specifications and quality management systems that have greatly improved the quality and safety of aquatic products.

Developing a modern processing industry and enhancing industrial quality

In order to comply with the high standards of the international market, China's aquatic products processing enterprises have constantly strengthened their self-improvement and elevated their abilities. In doing this, they have formed a number of modern export-oriented enterprises for aquatic products processing, mainly private enterprises that are characterized by the use of advanced technology, standardized specifications and honesty in business operations. These enterprises actively compete in the international market and have become leading enterprises in the aquaculture industry in China, thus promoting the aquaculture industry and modern fisheries with the characteristics of mass production and integrated management.

Actively open up the market and strengthen international exchanges

Although China is a developing country, we actively participate in the process of globalization and promote establishment of a fairer and freer global trade system. As China's aquatic products approach the world, we open our aquatic market with a positive attitude through substantially lowering our import tariffs and developing the free trade zone. Meanwhile, China has also introduced advanced production technology, management experiences and food safety concepts to promote sound development of its aquaculture industry.

CHALLENGES IN THE DEVELOPMENT OF INTERNATIONAL TRADE IN AQUACULTURE PRODUCTS

The aquaculture industry and the international trade of aquaculture products have not only provided high-quality animal protein for us and ensured food security, but also played an important role in such aspects as promoting economic growth in developing countries, shaking off poverty, and increasing job opportunities and fishermen's incomes, as well as protecting marine resources and the environment. However, we should be aware that there are many factors, including trade environment and aquaculture production, that constrain the development of international trade in aquaculture products.

Problems in the criteria for food safety

It is the government's obligation to protect consumers' health and safeguard their rights and interests. It has become a common understanding in the world's fisheries to control drugs used in aquatic products and guarantee the quality and safety of products. However, it is a complicated process to develop hazard risk assessment and to set up scientific quality and safety standards. In recent years, a succession of standards has been established in some importing countries, and the standards have become increasingly strict. Therefore, making use of "green measures" to control importations has become a trend. There were 54 World Trade Organization (WTO) members submitting 853 bulletins of *Agreement on the Application of Sanitary and Phytosanitary Measures* in 2005. Among them, there were 357 bulletins concerning food safety, which was

the largest number compared to other fields. Different quality and safety standards often cause unnecessary consumer panic and market levity between export and import countries, which brings about big losses for aquaculture producers.

Problems in implementation and application of anti-dumping measures

In recent years, anti-dumping measures have become an important method to constrain the trade of aquatic products. WTO's *Agreement on Dumping and Anti-Dumping Measures* aims at constraining countries that disrupt normal trade relations through dumping. But unfortunately, more and more people believe that this agreement has become a method for WTO members to protect their markets and production. Regardless of the discrepancy among different countries in terms of economic development mode, management system and labor costs, they determine margins of dumping subjectively and levy punitive tariffs at will. These phenomena cause trade disputes and increased friction. Although the trade surplus on aquatic products for export obtained by the cheap labor force in developing countries is over $US 20 billion each year, the profits are less because of the increasing trade friction. In today's international trade, people engaged in aquaculture are often in a disadvantaged position.

Problems in the opportunities of market access

The overall level of import tariffs in the developed countries is low, but tariff peaks and escalation still exist, which restricts developing countries from further developing their processing industries, promoting their industrial quality and improving their modernization in varying degrees. Meanwhile, some countries still set up market access quotas or tariff quotas, which constrain normal trade in aquatic products. In addition, with the high starting point, strict requirements and complicated procedures, as well as traceable standards, the requirement for product certification and accreditation systems has appeared in recent years, which has increased costs and created difficulties for the aquatic products produced by developing countries to obtain access to the market.

Problems facing the development of aquaculture

This includes the following three aspects:

- the unscientific use of water resources for aquaculture, the expansion of scale and improvement of per unit area yield resulting in increased outbreaks of disease that threaten the quality and safety of products;
- the traditional way of scattered aquaculture constrains the promotion of production scale and standardized aquaculture; and
- as developing countries achieve economic growth and as the process of urbanization accelerates, some water areas become seriously polluted and the quality of the environment is reduced, which exerts a negative influence on the healthy development of aquaculture.

PROMOTING THE SUSTAINABLE DEVELOPMENT OF AQUACULTURE AND ESTABLISHING A NEW ORDER FOR HARMONIOUS INTERNATIONAL TRADE OF AQUATIC PRODUCTS

The declining trend of the world's fisheries resources has not been reversed and in the future, the increased need for international aquatic products will depend mainly on the development of aquaculture. Looking to the future, we can see that aquaculture can become an important and rapidly developing industry. If we want to develop sustainable aquaculture, we must promote industrial quality and at the same time create a favorable external environment and strengthen international cooperation.

Promoting industrial quality refers to establishing the scientific development concept, constantly exploring healthy aquaculture methods and solving the problems

concerning feed and the environment. In addition, we should also build a resource-saving and environmentally friendly aquaculture, produce products according to international standards, transform the growth mode in a comprehensive way and improve the quality of development. To protect the healthy development of aquaculture, we must strengthen its planning and infrastructure, promote the improved species system, improve disease prevention and control, and adopt a standardized system for quality and safety supervision for aquatic products.

Creating a favorable external environment means establishing a fair and impartial international trade order for aquatic products and creating a harmonious and open international trade environment with orderly competition for aquatic products. We believe that we should adopt the following three principles so that we can establish a reasonable trade order for the aquatic products. Firstly, it should be beneficial to the establishment of normal trade relations between developing countries and developed countries, so as to achieve equality and mutual benefit as well as opening up and creating a win-win situation. Secondly, it should be instrumental in satisfying the increased consumer demands and protecting food safety in the world. Thirdly, it should be conducive to maintaining an ecological environment of resources, promoting harmony between human beings and nature, and trading in a responsible and sustainable way.

Therefore, we would like to put forward the following four proposals:

- Firstly, we should set up scientific, reasonable, appropriate and workable technical regulations or standards. We should also emphasize the role of risk assessment, establish scientific risk assessment mechanisms and formulate standards for aquatic product safety on the basis of scientific analysis and objective evaluation. To establish technical regulations and standards requires us to consider developing countries' capability to adapt to them and to give developing countries enough time to implement them.
- Secondly, we should be in strict accordance with WTO trade regulations. Imposing punishments and sanctions cannot, by itself, solve trade problems. We should prevent the abuse of anti-dumping measures and technical safety standards, increase transparency in introducing and implementing regulations, and resolve trade disputes through dialogue and consultation.
- Thirdly, we should orderly promote various certifications. That is to say, we should intensify guidance towards meeting the standards of these certifications in order to prevent them from becoming barriers to market access and at the same time consider most developing countries' production level and their capacity to implement certification programmes.
- Fourthly, we should promote trade liberalization and facilitation. We must eliminate quotas; reduce tariff peaks and escalation; provide a favorable environment for transparent, effective and fast clearance and further simplify entry and exit procedures so as to increase the efficiency in clearance.

Strengthening international cooperation means extensively developing the all-round cooperation in terms of economy, technology, management, service and information on aquaculture and its trade development. Starting from the practical needs of the developing countries, we should increase our support for their capacity building, and improve the target-direction and effectiveness of economic and technological support. In addition, we should strengthen exchanges and communication among different countries, seek common interests, eliminate misunderstandings, and promote mutual understanding and trust according to the principle of seeking common ground while resolving differences. The role of international organizations and networks such as the Food and Agriculture Organization's (FAO) Sub-Committee on Aquaculture (COFI) and the Network of Aquaculture Centres in Asia-Pacific (NACA) in different regions should be highlighted.

Distinguished guests, ladies and gentlemen,
In the 21st century, aquaculture will take on historically great responsibilities of revitalizing fisheries. Therefore, developing and maintaining trade of aquatic products will have great significance to the sustainable development of aquaculture so that our increased need for aquatic products will be met. Let's join hands together to make concerted efforts to establish a new order for the harmonious trade of aquatic products and promote the development and prosperity of the world's fisheries.
Thank you all.