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**INTERNATIONAL HIGH-LEVEL CONSULTATIVE EXPERT  
WORKSHOP (HLCEW) ON SUSTAINABLE DEVELOPMENT OF  
AQUACULTURE AND INLAND FISHERIES**

**Wuxi, Jiangsu Province, China, 1–5 June 2015**



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## **PREPARATION OF THIS DOCUMENT**

This document represents the report of the International High-Level Consultative Expert Workshop (HLCEW) on Sustainable Development of Aquaculture and Inland Fisheries, held from 1 to 5 June 2015 in Wuxi, Jiangsu Province, China. It was prepared by Dr Nathanael Hishamunda, Senior Aquaculture Officer (Economics, Policy and Planning), Aquaculture Branch of the FAO Fisheries and Aquaculture Department, and by Dr Timothy Pickering, Secretariat of the Pacific Community.

Mr Jia Jiansan (Deputy Director, FAO Fisheries and Aquaculture Resources Use and Conservation Division), Mr Zhongwei Liu (Programme Officer, FAO TCS) and Dr Yuan Xinhua (Freshwater Fisheries Research Centre) contributed to the preparation of this report. Ms Elisabetta Martone, FAO consultant, formatted and edited the report.

The China Ministry of Agriculture's Bureau of Fisheries, the Chinese Academy of Fishery Sciences, the Centre of International Cooperation Service, and the Freshwater Fisheries Research Centre played an instrumental role in the organization and delivery of the workshop.

The material in the appendixes is reproduced as submitted.

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### **ABSTRACT**

The International High-Level Consultative Expert Workshop (HLCEW) on Sustainable Development of Aquaculture and Inland Fisheries was held in Wuxi, Jiangsu Province, China, from 1 to 5 June 2015 under the framework of the FAO-China South-South Cooperation (SSC) Programme, which funded the event. The workshop was organized by FAO, jointly with the Centre of International Cooperation Service, Ministry of Agriculture of the People's Republic of China, with support from the Freshwater Fisheries Research Centre of the Chinese Academy of Fishery Sciences (CAFS).

The purpose of the workshop was to formulate a five-year agenda of priorities for action to promote sustainable inland fisheries and aquaculture development for food security and rural development in developing countries, and to identify the most urgent needs and challenges in less-aquaculture-developed countries and propose mechanisms to address them via South-South cooperation, especially the FAO-China SSC Programme.

The workshop was attended by ten participants from ten countries (Bangladesh, Cambodia, Guinea-Bissau, Indonesia, Jamaica, Kazakhstan, Mexico, Namibia, Senegal and Uzbekistan). Two regional partner institution representatives (Network of Aquaculture Centres in Asia-Pacific, and Secretariat of the Pacific Community), 17 host-country (China) institution representatives and 6 FAO staff attended the workshop.

Four sessions took place: (i) overview on how sustainable fisheries and aquaculture can contribute to food security and rural development; (ii) country presentations on their situation, needs, challenges and opportunities in aquaculture for food security and rural development; (iii) partners' presentations on how their work priorities and programmes related to fisheries and aquaculture can contribute to food security and rural development; and (iv) developing proposals related to a multipartner programme on fisheries and aquaculture for food security and rural development in developing countries.

The workshop identified 15 project ideas: (i) enhancing food and nutrition security through capacity building in tilapia and catfish culture in West Africa, Latin America and the Caribbean, and the Pacific; (ii) enhancing food and nutrition security in West Africa through aquaculture and rice farming within the SSC Programme; (iii) improving governance (policy, legal and regulatory framework) to ensure sustainable aquaculture development for some countries in sub-Saharan Africa, Latin America and the Caribbean; (iv) improvement of aquaculture production through adaptive research and development programmes in sub-Saharan Africa, Latin America and the Caribbean; (v) empowering youth and women in West Africa, Latin America and the Caribbean through aquaculture within the SSC Programme; (vi) regional training programme on aquaculture governance in sub-Saharan Africa, Asia-Pacific, Central Asia, Latin America and the Caribbean; (vii) strengthening aquaculture statistics and data management in sub-Saharan Africa, Asia-Pacific, Latin America and the Caribbean; (viii) promoting cage culture development and good management practices in sub-Saharan Africa, Asia-Pacific, Latin America and the Caribbean; (ix) promotion of culture-based fisheries and stock enhancement practices in Asia-Pacific, Latin America and the Caribbean; (x) promotion of quality farm-made fish feeds and good feeding practices in sub-Saharan Africa, Asia-Pacific, Latin America and the Caribbean; (xi) promotion of integrated agriculture-aquaculture, multitrophic farming, and aquaponics systems in sub-Saharan Africa, Asia, Central Asia and the Pacific; (xii) improved genetic quality of aquaculture seed and conservation of genetic resources biodiversity; (xiii) strengthening aquatic animal health management and biosecurity control in sub-Saharan Africa, Asia-Pacific, Latin America and the Caribbean; (xiv) increasing the resilience of fish farmers and the aquaculture sector

against climate change and other risks in sub-Saharan Africa, Asia-Pacific, Latin America and the Caribbean; (xv) promotion of aquaculture as a business and fostering development of aquaculture value chains in sub-Saharan Africa, Asia-Pacific, Latin America and the Caribbean. The meeting also drafted concept notes for these project ideas.

The meeting: (i) recommended FAO develop “project concept notes” produced by the workshop into fully fledged projects for financing soonest; (ii) recommended FAO (TCS) send “project request forms/templates” to workshop participating and non-participating countries in order for them to submit requests for project funding to FAO; (iii) requested FAO (TCS) to clarify to countries the step-by-step process to follow when requesting a project within the SSC framework; (iv) requested the Government of China to establish a “credit line for aquaculture development in developing countries, especially for Africa”. The goal is to make it easier for Chinese entrepreneurs wishing to invest in aquaculture in Africa or elsewhere in developing countries to access the much-needed capital (loans) in China for investment in Africa and elsewhere, in the form of joint ventures; (v) requested workshop organizers to organize a workshop on “investment and partnership opportunities in aquaculture in Africa” in the framework of FAO-China SSC; (vi) requested workshop organizers to organize similar workshops in other SSC countries or regions as appropriate; (vii) requested workshop organizers to facilitate partnership/joint venture opportunities with China; (viii) requested that the SSC scheme find other practical ways of promoting and supporting aquaculture as a business that attracts investments, and ensures participation by women and youth to pull them out of the state of hunger, unemployment and poverty; and (ix) recommended organizers create a network where all parties involved (FAO, China, SSC participating countries) can share information, using the CAFS platform.

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## ABBREVIATIONS AND ACRONYMS

ANA	Agence Nationale d'Aquaculture, Senegal
ANAF	Aquaculture Network for Africa
APA	Agency for the Promotion of Aquaculture, Senegal
ARTC	Aquaculture Research and Training Centre
BMP	best management practice
CAFS	Chinese Academy of Fishery Sciences
CAMFA	Conference of African Ministers of Fisheries and Aquaculture
CARS	China Agriculture Research Systems
CFR	community fish refuges
CICOS	Centre of International Cooperation Service
CIFAA	Committee for Inland Fisheries and Aquaculture
CPF	country programming framework
DCFA	Direction for Continental Fishing and Aquaculture, Senegal
FAO	Food and Agriculture Organization of the United Nations
FCR	feed conversion ratio
FFRC	Freshwater Fisheries Research Centre
FiA	Fisheries Administration, Cambodia
GDP	gross domestic product
GIAHS	Globally Important Agricultural Heritage Sites
HHRRC	Hunan Hybrid Rice Research Centre
HLCEW	International High-Level Consultative Expert Workshop
HLD	high-level dialogue
HLW	high-level workshop
IGO	intergovernmental organization
IMTA	integrated multitrophic aquaculture
LGED	Local Government Engineering Department, Bangladesh
LIFDC	low-income food-deficit country
LVFO	Lake Victoria Fisheries Organization
MAWR	Ministry of Agriculture and Water Resources, Uzbekistan
MOA	Ministry of Agriculture, China
MOU	memorandum of understanding
NACA	Network of Aquaculture Centres in Asia-Pacific
NARDI	National Aquaculture Research Development Institute, Cambodia
NCFFI	National Conventional Freshwater Fishery Industry
NFFP	NEPAD-FAO Fish Programme
NFP	national focal point
PICTs	Pacific islands countries and territories
PSE	Plan Sénégal Emergent
R&D	research and development
RAP	FAO Regional Office for Asia and the Pacific
RAS	recirculating aquaculture system
RI	regional initiative
SPC	Secretariat of the Pacific Community
SSC	South-South cooperation
SWOT	strengths, weaknesses, opportunities and threats
TAP	Tropical Agriculture Platform
TCS	South-South Cooperation and Resource Mobilization Division
TN	total nitrogen
TP	total phosphorous



## **OPENING OF THE WORKSHOP**

1. The International High-Level Consultative Expert Workshop (HLCEW) on Sustainable Fisheries and Aquaculture was organized in Wuxi, Jiangsu Province, China, from 1 to 5 June 2015 under the framework of the FAO-China South-South Cooperation (SSC) Programme.
2. The opening session was chaired by Dr Matthias Halwart, Senior Aquaculture Officer, Fisheries and Aquaculture Resources Use and Conservation Division, FAO, Rome, Italy, following the workshop agenda, which is presented in Appendix 1 of this document.
3. The workshop was attended by ten participants from ten countries (Bangladesh, Cambodia, Guinea-Bissau, Indonesia, Jamaica, Kazakhstan, Mexico, Namibia, Senegal and Uzbekistan). Two regional partner institution representatives (Network of Aquaculture Centres in Asia-Pacific [NACA], and Secretariat of the Pacific Community [SPC]), 17 host-country (China) institution representatives and 6 FAO staff attended the workshop. The list of participants is given as Appendix 2.
4. Mr Jiansan Jia, Deputy Director, Fisheries and Aquaculture Resources Use and Conservation Division, FAO, Rome, Italy, delivered a welcoming address. He thanked the Government of China for its past support for international development of aquaculture, and for hosting the current event. He indicated that the purpose of this event was to formulate a five-year agenda of priorities for action to further develop aquaculture and inland fisheries, and to propose mechanisms to implement them via SSC. His address is given in Appendix 3.
5. On behalf of the Ministry of Agriculture (MOA) of the People's Republic of China, the workshop was opened by Mr Ji Wenyuan, Deputy Director General, Centre of International Cooperation Service (CICOS), Ministry of Agriculture, Government of China. He explained that the aim of the workshop was to share experiences in inland fisheries and aquaculture among developing countries, understand the constraints, and formulate plans for cooperation to address future challenges. He extended a warm welcome to all delegates present, and offered his thanks to all the Chinese institutions represented in the room. His address is given in Appendix 4.
6. Mr Li Shumin, Deputy Director General, Bureau of Fisheries, Ministry of Agriculture, Government of China; Prof Zhang Xianliang, President, Chinese Academy of Fishery Sciences (CAFS), and Mr Augusto Ussumane So, Promotor Pitche Aquaculture Project and Former Minister of Economy and Finance, Guinea-Bissau, contributed opening remarks to the workshop. Their remarks are reported in Appendixes 5–7.
7. Dr Matthias Halwart welcomed the participants on behalf of the secretariat of the workshop. His address articulated the rationale and objectives of the workshop and indicated that the goal was for participants to identify the regional priority needs, not as individual countries but as representatives of their region, after taking stock of existing needs, lessons learned, and priorities, especially in less aquaculturally developed regions. He stressed that the workshop wanted to develop, in a collaborative way, an agenda of priorities for actions for SSC. He pointed out that SSC helped developing countries to benefit from innovations, lessons learned and best practices in a true exchange between equal partners in search for attainment of sustainable food and security nutrition.

## **OVERVIEW ON HOW SUSTAINABLE FISHERIES AND AQUACULTURE CAN CONTRIBUTE TO FOOD SECURITY AND RURAL DEVELOPMENT**

8. This Session was chaired by Dr Nathanael Hishamunda, Senior Aquaculture Economics, Policy and Planning Officer, Fisheries and Aquaculture Resources Use and Conservation Division, FAO, Rome, Italy. Dr Timothy Pickering, SPC, was the rapporteur.

9. Presenting current status, trends, and future growth of global aquaculture, Mr Jia indicated that:

- With 70.2 million tonnes of fish in 2013, aquaculture contributed 43 percent of the total global fish production in 2013 and about 49 percent of fish consumed.
- Global fish consumption was 19.7 kg per person per year in 2013, of which 9.8 kg was attributed to aquaculture.
- Capture fisheries production has levelled off for the past 20 years now, at about 90 million tonnes, indicating that any further increase in global fish production is only possible via aquaculture.
- With a share of more than 90 percent of the world's fish production, the top ten aquaculture producers, with the exception of Norway, are all from the developing world, and almost all from Asia, except Chile and Egypt.
- The top 15 producers provide about 93 percent of global production.
- The main conclusion from these statistics is that the development and production distribution of aquaculture is greatly uneven across the world. These regional differences justify the meeting to reflect on how to unlock the aquaculture potential of the other developing countries so that they can produce more. Africa, for example, has achieved a large increase in production over the last seven years, and, as Oceania, has a vast production area available for aquaculture, but production in absolute terms remains quite small.

10. Mr Jia further indicated that aquaculture had important social and economic impacts, including:

- Food security – fish is the number one source of animal proteins for many of the world's people.
- Reduction of urban drift.
- Improvement of food security.
- Increase in nutrition through enhanced protein intake.
- Employment creation.
- Contribution to gross domestic product (GDP).
- Improvement of local sales and tax revenues.
- Provision of rural livelihoods. In 2012, there were 19 million fish farmers in the world, directly engaged in aquaculture production.

11. Concerning markets and trade status, Mr Jia reported that:

- About 40 percent of food fish is traded internationally, for about US\$130 billion in 2013.
- The prices of farmed fish are lower than ten years ago, due to a combination of factors, which include the 2008 global economic crisis, the increase in production and supply, technological improvements, improved logistics in distribution, and economies of scale from increased production.

12. Mr Jia's discussion of aquaculture diversification revealed that:

- Species composition of aquaculture products is highly diversified, with more and more efforts going into diversification and addition of more species to those already under cultivation.
- About 575 aquatic species from all taxonomic groups are now being farmed, with 359 of those being finfish.
- Since 2000, finfish production from aquaculture has doubled; molluscs production has increased by 60 percent; crustaceans are up fourfold; and the output of food fish in total has more than doubled.
- One-third of animal aquaculture species are non-fed species (such as filter feeders).
- Seaweed production is impressive, with four dominant countries producing about 95 percent of the world's total in 2013: China (13 479 355 tonnes or 50.1 percent; Indonesia

(9 298 474 tonnes or 34.6 percent); the Philippines (1 558 378 tonnes or 5.8 percent); and the Republic of Korea (1 131 305 tonnes or 4.2 percent).

- There are many farming systems, varying greatly in technical sophistication and input intensity.
13. Looking ahead into future trends, Mr Jia stated that:
- The general trend suggests a very promising future for further growth in aquaculture.
  - Aquaculture will continue growing at a slower pace with more intensified and diversified production systems and species due to scarce land and water resources.
  - Sea farming is increasing, with many countries exploring off-the-coast or offshore aquaculture.
  - The cost of production is increasing while sales prices are going down.
  - Profit margins will become smaller; implying that it is improved technologies, productivity, and economies of scale that will lead to growing volumes of fish production and increased fish sales.
  - Market access requirements are becoming more stringent.
  - Consumers' concerns require labelling and certification of aquaculture products; consumers prefer quality with convenience.
  - Small farmers need empowerment in export markets.
  - An additional 50 million tonnes of aquatic products will be required by 2030 to maintain the current per capita consumption.
  - Further fish supply will have to come from aquaculture; aquaculture's share of total fish supply will have to be greater than 60 percent in about 20 years' time.
  - Future aquaculture growth and economic potential are as important as the great challenges facing the sector.
14. In his presentation, Mr Jia identified several challenges facing the aquaculture sector.
15. Resource-related challenges include:
- Conflicts and competition for land and water with other users such as agriculture and tourism.
  - Constraints of seed from the wild; it will be necessary to set up regional broodstock management centres.
  - Use and exchange of aquatic genetic resources in aquaculture.
  - Fishmeal and fish oil, and use of "low value" fish.
  - Improved feed conversion ratio (FCR) and use on-farm feed and feeding.
16. Challenges related to services include:
- Aquatic animal health in terms of prevention and preparedness, contingency strategies in the event of disease outbreaks, use of chemicals and drugs, and human health concerns.
  - Timely access to adequate and affordable capital, especially in Africa.
  - Aquaculture insurance against, *inter alia*, climate change impacts.
17. Mr Jia also discussed the impacts of climate change. He indicated that the impacts of climate change on aquaculture were not well known, but that small island, resource-poor, developing States were likely to be most vulnerable to climate change. He underlined the need to enhance resilience and adaptability to climate change, adopt adaptation policies and measures and apply best management practices (BMPs), and have aquaculture insurance and early warning systems.
18. He concluded by recalling that the way forward for global aquaculture hinges upon good government support, policy frameworks and national development strategies, an enabling environment, solid private sector investment (it can be kick-started by public-private partnerships)

because aquaculture must be done as a “business”, technological breakthroughs, and international and regional cooperation, especially SSC.

19. A second speaker, Mr Li Shumin, Deputy Director General, Bureau of Fisheries intervened to give an overview of achievements and challenges in China’s experience on fisheries and aquaculture.

20. Mr Li Shumin indicated that China’s aquaculture development had been very rapid, moving from only 2 million tonnes of annual production in 1978 to 40 million tonnes in 2014. Moreover, the structure of the fish industry in China much changed during this period. In 1978, only 26 percent of China’s fish was derived from aquaculture compared with 76 percent from capture fisheries. In 2014, 36 years later, aquaculture fish production represented 74 percent of the nation’s total fish production, with capture fisheries accounting for 26 percent. The share of inland fisheries and aquaculture in total fisheries production in China is about 62 percent. Through aquaculture, China has been able to satisfy its market demand for fish.

21. Mr Li Shumin further pointed out that there were 200 cultured species in China, of which 50 were commonly cultured “staple” species. By providing one-third of China’s quality animal proteins, aquaculture has underpinned good food and nutrition security for China’s citizens. In addition, aquaculture contributes 10 percent to agriculture GDP, employs 5 million people in direct livelihoods, and another 5 million indirectly. Some aquaculture systems also contribute to mitigation of climate change in China. For example, mollusc and seaweed farming contribute to carbon sequestration.

22. He discussed constraints to China’s aquaculture as being the threats to sustainability of some culture practices by, for example: contributing to eutrophication due to uneaten feeds and faeces; very high densities such as coastal cages, which threatens food safety; direct use of low-value fish as feed in aquaculture; increasing risks linked to natural disasters such as typhoons or red tides; risks of diseases; environmental risks from wastewater discharges; market risks due to fluctuating prices and changing international trading conditions; use of drugs in some culture operations; and increasing production costs in coastal aquaculture (costs of materials, fuel, feeds, etc.) while fish prices are easing.

23. However, he underlined that China’s aquaculture had a bright future, with its advantages being substantial government support, a solid industry base, a fine system of hatcheries for breeding, industrial aquaculture that can be upgraded and further developed, and increase in efficiency of ponds.

24. Challenges to China’s aquaculture include strictly implementing sustainability requirements while increasing aquaculture production to enable a reduction in reliance upon capture fisheries; the target is to achieve a 10 percent increase in the next 5 years. To achieve this goal, there is a need to: set up more advanced aquaculture industries (for example, to upgrade pond facilities and performance through innovative engineering); build deep-sea aquaculture platforms; have better seed production systems; promote aquaculture research and technological innovations; develop new strains for aquaculture; put in place improved disease control measures; promote complete feeds; reduce discharges from aquaculture; strengthen aquaculture surveys; and strengthen risk management and assessment. The aquaculture industry in China cannot and will not rely entirely on government; it needs to cooperate with banks for investment capital. Entrepreneurs will further be encouraged to invest in aquaculture.

25. Mr Ge Xianping, Chief Scientist, Ministry of Agriculture, Government of China, intervened to present “Technology system of freshwater aquaculture industry in China: achievements, constraints and prospects”. He indicated that:

- The MOA has set up 50 technology systems for China Agriculture Industry, of which five are fishery (aquaculture) technology systems, respectively for conventional freshwater fish, shrimp, tilapia, flatfish and shellfish.

- The MOA's activities in the Conventional Freshwater Fish Technology System cover the conventionally cultured freshwater fish species, but also include some pond-based brackish-water or marine species such as shrimp and flatfish.
- For the National Conventional Freshwater Fishery Industry System (NCFFI), there are 30 demonstration centres in the different regions of China.
- The research under the NCFFI is mainly conducted on the conventional carps, which have a long history of culture in China. Of these species, 7 represent more than 67 percent of the total freshwater fisheries production of 22 million tonnes per year. Grass carp contributes most to this production with 18 percent, ahead of silver carp (13.7 percent), common carp (10.78 percent), bighead carp (10.76 percent) and crucian carp (9.3 percent).

26. Dr Ge Xianping further informed the meeting that:

- Within the China Agriculture Research Systems (CARS) for tilapia, the MOA links a system of 10 research teams and 10 demonstration centres, mainly in the southern provinces. New tilapia strains that have been developed in the Freshwater Fisheries Research Centre (FFRC) and registered are Zhongwei No. 1, Xia'ao No. 1 and Au-Ni tilapia.
- In 2014, China produced 1.7 million tonnes of tilapia, of which 403 000 tonnes were exported, bringing US\$1.5 billion into China's economy.
- The NCFFI has been innovative in establishing water recirculation pond aquaculture systems, which include three-level water purification systems before water is put back into the fish culture ponds. With this system, the removal rate of total nitrogen (TN) can reach 74 percent, 68.5 percent for total phosphorous (TP) and 60.5 percent for ammonia nitrogen. Other innovations include precision feeding systems that are computer-remote-controlled, semi-automatic harvesting equipment, use of on-farm solar energy sources, water exchange equipment to exchange water between upper and lower strata of pond thermoclines, and development of vaccines for preventing some carp diseases such as grass carp haemorrhagic virus disease. The NCFFI has developed many processed fish products from aquaculture because live fish sales limit the scope for distribution and value-adding.

27. Mr Miao Weimin, Aquaculture Officer, FAO Regional Office for Asia Pacific (RAP), Bangkok, Thailand, presented "Aquaculture development in the Asia-Pacific region in terms of trends, issues and needs". He indicated that, during the last three decades, aquaculture in the region had been growing, but at declining rates. In 1985–1995, the average growth was high at 11 percent; in 1995–2005, it was 7.5 percent, and 7.1 percent in the most recent decade of 2005–2014. While there were some important fluctuations before the 2005–2014 period, the growth of the sector has been very stable and consistent in the last decade, implying that this is the hallmark of a mature industry that is here to stay.

28. In addition, Mr Miao Weimin reported that:

- In this same three decades, the contribution of Asia has moved from 85 percent to 91 percent of global production if seaweed is accounted for. If seaweed is excluded from the production, Asia's share of the global aquaculture production is 89 percent.
- In the last 30 years, the number of species farmed in the region has doubled from 110 to 220. The goal has been to meet diversified and changing consumer demand, and provide new business opportunities. However, the challenge of species diversification is the need for diversified culture technologies, management practices and inputs. In value, *Penaeus vannamei*, alien to the region, is the top species.
- Another feature of aquaculture in the region is the diversity of culture environments and practices; all aquatic environments are used for aquaculture and are highly diversified in levels of intensity, from extensive to "super-intensive". Even finfish cage culture ranges from low-tech to high-tech.
- Intensification of aquaculture is vital because space and water are limited in this highly populated region, but it is also necessary for economics needs. For example, on an annual

basis, super-intensive catfish culture in Viet Nam produces 500–600 tonnes/ha, super-intensive shrimp (*P. vannamei*) farming systems in Indonesia yield about 90 tonnes/ha, and intensive culture of carps in China produces 20–30 tonnes/ha. Intensification is often taken as a strategy to achieve sound economic returns with slack market price, but it is not always successful.

- In the 1980s, the focus of aquaculture in the region was mainly for household consumption and local markets.
  - In Asia, the aquaculture focus is now basically for sale instead of self-consumption, farmers produce more for household income generation and profit than food security.
  - Now, products are more destined for distant mainstream domestic markets and international trade.
  - There is an increasing intraregional trade: formal trade and border trade, with important unreported cross-border trade; perhaps 40 percent of the trade goes unreported between some Asian countries.
  - There is increasing development in the processing of cultured products.
  - There has been a rapid increase in international trade; Asia is the most important supplier of aquatic products in global trade.
  - Export of aquatic products have grown considerably:
    - 4.2 million tonnes in 1991;
    - 12.8 million tonnes in 2011;
    - exports are underestimated due to informal trade: e.g. Cambodia official statistics indicated export of 20 000 tonnes of aquatic products with a value of US\$60 million, when actual exports would be more than 33 000 tonnes with a value of more than US\$100 million.
  - Four Asian countries rank among the top ten aquatic exporters by volume: China (first), Thailand (fifth), Indonesia (seventh), and Viet Nam (ninth).
29. Mr Miao Weimin described the source of strength of the Asian aquaculture as being:
- strong government support in terms of conducive government policies and supporting strategies;
  - advancement in technologies: public support to research and development (R&D) and extension;
  - fast economic growth in the region resulting in increased demand for aquatic food;
  - traditional importance of fish products in people's diet and cultural value;
  - well-established aquaculture value chains.
30. He indicated that Asian aquaculture had its own challenges, including:
- competition with other sectors for land and water;
  - dependence on external supply of key feed ingredients such as fishmeal and soybeans;
  - overdependence of some commodities on external markets, with problems of competition and market access;
  - vulnerability of small farmers to natural (mostly climate-related) disasters and socio-economic impacts;
  - lack of well-structured and socially harmonized aquaculture value chains in many countries.
31. Discussing key technical bottlenecks to the further development of the sector, Mr Miao Weimin identified them as:
- availability and cost of key feed ingredients;
  - more stringent restrictions on products safety and environment impacts;
  - supply of quality aquaculture seed (genetically improved) for some commodities such as lobsters;



- biosecurity and animal health problems, and the low capacity to deal with them in many situations;
- lack of quality inputs supply in many emerging countries.

32. Mr Miao Weimin further suggested opportunities and needs in the sector. Opportunities consist of:

- significant increase in demand for fish and other aquatic products resulting from population growth and improvement in living standards that is changing diet habits. It is estimated that aquaculture production in Asia will need to increase by some 60 percent by 2030 from the current level;
- increasing global and intraregional trade of aquatic products;
- governments' conviction that aquaculture is a strategy to improve rural livelihoods, contribute to local development and provide other social benefits to households and communities.

33. Needs to support sustainable growth of the sector were identified as:

- improved governance: informed planning and effective regulation;
- technological breakthrough to tackle existing and emerging problems;
- increased resilience of farmers and the sector, including development of practical aquaculture insurance programme/products.
- strengthened aquaculture value chain development;
- increased social acceptability of the aquaculture industry;
- equity in benefit sharing.

34. Furthermore, Mr Miao Weimin underlined some potential areas for cooperation within the framework of the South-South spirit. These are:

- sharing sector development policies and strategies;
- sharing effective management systems for sustainable growth of aquaculture such as environment impact control, food safety control, biosecurity control, and biodiversity protection;
- aquaculture value chain development;
- aquaculture insurance, public-private partnerships;
- sharing technological advancements in aquaculture including:
  - technologies in genetic improvement and exchange of the products,
  - effective seed production technologies,
  - animal health management,
  - nutrition and feed, alternative feed ingredients,
  - aquaculture environment management,
  - new farming system for resource efficiency and sound environmental benefits,
  - climate-smart aquaculture, etc.

## COUNTRY PRESENTATIONS ON THEIR SITUATION, NEEDS, CHALLENGES AND OPPORTUNITIES IN AQUACULTURE FOR FOOD SECURITY AND RURAL DEVELOPMENT

35. This session was chaired by Dr Nathanael Hishamunda. Dr Timothy Pickering was the rapporteur.

36. Each country's representative made a presentation sharing the country's situation, needs, challenges and opportunities in aquaculture for food security and rural development. Summaries of presentations are reported hereafter region by region, and within a region, country by country in alphabetical order.

37. For **Africa**, presentations were made by representatives from Guinea-Bissau, Namibia and Senegal. Their papers are summarized as follows.

38. The presentation on **Guinea-Bissau** was made by Mr Augusto Ussumane So, Promotor Pitche Aquaculture Project and Former Minister of Economy and Finance, Guinea-Bissau. He indicated that:

- Guinea-Bissau is a small West African developing nation with a high poverty rate, extremely high unemployment, and with a high proportion of households affected by food and malnutrition insecurity.
- Its ecosystems include two major transborder rivers (the Geba from Senegal and the Corubal from Guinea Conakry), several national rivers (Cacheu, Mansoa, Cumbijã), many water courses (Rio Grande de Buba and Cacine, etc.), freshwater or brackish-water lakes, a high degree of interpenetration of land and sea, and 3 400 km<sup>2</sup> of mangrove. This territory with very rich biodiversity is propitious to the reproduction of a number of precious fish species (fish and crustaceans).
- Aquaculture is a new and emerging food production sector and, currently, it has little in the way of enabling legislation or policy documents, although political support for the sector exists.
- An aquaculture development strategy and plan were developed in 2013 with assistance from FAO; both documents identified much scope for growth of a national aquaculture sector.
- Government institutional support is now being provided by a newly created Secretariat of Fisheries. However, efforts to implement the aquaculture plan are hampered by a lack of financial and human resources capacity.
- A further government initiative to create an enabling environment is the establishment of a “one-stop-shop” agency to facilitate applications by foreign investors for start-up ventures in industries such as aquaculture.
- Financial and technical capacity to start up aquaculture ventures or projects in Guinea-Bissau is very limited.
- The main interest is in tilapia aquaculture. However, very little is available in the way of seed, feed, technical skills, or investment capital, and there is almost no aquaculture infrastructure. An additional main issue in creating an aquaculture industry in the country is that people literally do not know where to start.
- There are no small or medium-sized enterprises (SMEs) in aquaculture in the country as yet.
- To start off the industry, FAO is currently facilitating the creation of lead-farmer, satellite-farmer contract growing schemes.
- Guinea-Bissau has much potential, but the country is in need of international help to help start aquaculture effectively.
- While Guinea-Bissau's aquaculture industry profile is currently a list of “lacks” and “absences”, these “lacks” and “absences” in fact represent “investment opportunities”.
- According to of Mr Augusto Ussumane So (Guinea-Bissau Strategic and Operational Plan for 2015–2025):
  - private investment in aquaculture will be strongly encouraged;

- aquaculture will be developed through:
  - (i) identification of the most favourable zones,
  - (ii) creation of an aquaculture research and training centre (ARTC), which, in addition to conducting research in partnership with international institutions, will provide training in various freshwater and marine farming techniques including in finfish farming, shrimp farming, oyster farming, and serve as an “incubator” of aquaculture producers,
  - (iii) development and implementation of an “aquaculture support project” for the establishment and management of adequate production infrastructure (aquaculture farms), broodstock programme and hatcheries. The project will also set up a well-equipped unit for the formulation and production of good-quality and accessible aqua-feed (feed mill) to supply individual farms with adequate feed, while monitoring aquaculture activities to ensure the use of good aquaculture practices and their profitability.
- Guinea-Bissau needs technical and financial assistance to support aquaculture activities planned in the country (Strategic and Operational Plan 2015–2025) – “Terra Ranca”, namely in the following priority areas:
  - (i) policy formulation and programme planning/development of rules and regulations;
  - (ii) institutional capacity building (short-term specialist training and degree-oriented education);
  - (iii) research;
  - (iv) aquaculture demonstration project;
  - (v) funding;
  - (vi) seed production/feed and feeding.

39. **Namibia’s** Dr Moses Maurihungirie, Director of Inland Fisheries and Aquaculture, Ministry of Fisheries and Marine Resources, pointed out that:

- In the last decade, much progress has been made in Namibia to garner political support for their emerging aquaculture sector, which has manifested itself via the promulgation of comprehensive governance arrangements that span aquaculture legislation, regulations, policies and institutional support that includes the creation of a department of aquaculture within government. The State has invested in the construction and operation of regional aquaculture centres and demonstration farms.
- Namibia’s main emphasis is on freshwater fish farming, and this comprises three species: tilapia *Oreochromis andersonii* and *O. mossambicus* (but not *O. niloticus*), and catfish *Clarias gariepinus*. Freshwater aquaculture is typically made up of community-based cooperative activities in extensive systems, with the main objective being to produce fish for local use and food security.
- Monosex production of tilapia fingerlings is not being practised due to lingering concerns about use of methyl-testosterone hormone treatment in small fry, which need to be addressed via dissemination of accurate science-based information about this now-standard tilapia production technique.
- Namibia does not utilize the world’s main farmed tilapia species *O. niloticus* (Nile tilapia) as a precautionary conservation measure for indigenous southern African fish species such as Mozambique tilapia. Another constraint for aquaculture is access to quality feeds. Namibia’s feed plants are insufficient in output, and their products are sinking pellets that are not very digestible by fish, lack water stability, and contain a lot of fines. There are very few national training opportunities in aquaculture, so people need to be sent away to places such as China for training.
- There is a mariculture sector in Namibia that focuses on higher-value export-oriented species such as oysters *Crassostrea gigas*, mussels *Mytilis* sp., and abalone (*Haliotes midae*), which is currently worth about US\$2 million per year.

- Government’s support for aquaculture development has fostered engagement by private sector investors, with several dozen economically viable aquaculture ventures now established in the country.
- The growing aquaculture sector in Namibia currently has needs in the following priority areas:
  - feed and feeding,
  - seed production,
  - food safety;
  - health management,
  - environmental sustainability,
  - post-harvest handling,
  - institutional capacity building,
  - business planning and development,
  - harvesting,
  - marketing, market access and trade,
  - processing,
  - development of rules and regulations,
  - policy formulation and programme planning.

40. Mr Abdoulaye Niane, Technical Director, Agence Nationale d’Aquaculture (National Aquaculture Agency), **Senegal**, recalled the history of aquaculture in his country, which started with oyster farming tests in 1909–1911. Those activities were not successful due to marketing problems.

41. Freshwater fish farming started in 1980 with the “projets pisciculture villageoise” (village fish farming projects). The projects acquired fry from the Richard Toll fish station located in the north of the country. However, these village fish farming project activities did not last because they were not profitable, and because of technical and management problems. These recurring failures gave aquaculture a bad image in Senegal, and delayed its development there.

42. Aware of the importance of the role that aquaculture can play in countries’ economic development, the Government of Senegal created a Directorate for Inland Fisheries and Aquaculture in 2000. For efficiency purposes, the Government also created, in 2006, the Agency for the Promotion of Aquaculture (APA), which later became the Agence Nationale d’Aquaculture (ANA) – National Aquaculture Agency. Senegal’s goal for aquaculture development is discussed in economic and social documents such as the *Stratégie de Croissance Accélérée* (Accelerated Growth Strategy). The ANA, which is in charge of today’s national development aquaculture policy development and implementation, has achieved several results:

- Developed aquaculture growth enabling tools, with the support of FAO, including technical guidelines, a strategic operational plan (SOP), an aquaculture investment model for small and medium-sized aquaculture farms, and an aquaculture code.
- Created three regional ANA offices and four regional ANA branches across the nation for closer follow-up of and assistance to farmers.
- Fish production grew from 371.3 tonnes in 2012 to 704.6 tonnes in 2013, and to 1 095 tonnes in 2014, which represents an increase of 195 percent in relative terms between 2012 and 2014.
- Support has been provided to farmers for the implementation of 71 aquaculture farms.
- Twenty-two artificial lakes have been stocked for fish production.
- More than 3 000 people were trained in basic aquaculture techniques.
- Interactions between freshwater and marine aquaculture were strengthened.

43. Mr Niane further indicated that:

- The Plan Sénégal Emergent (Emerging Senegal Plan, PSE) is the current national reference document in terms of the country’s social and economic policy, including

on aquaculture. The PSE has identified 6 main sectors, one of which is aquaculture, and 27 job- and wealth-creating main projects capable of sustaining the country's growth.

- Concerning aquaculture, the PSE's aim is to produce 30 000 and 50 000 tonnes of fish by 2018 and 2023, respectively, and create 10 000 and 20 000 jobs, respectively.
- In order to further strengthen this fledgling industry in Senegal, there are various needs to be addressed, of which the five main ones are to:
  - establish a viable fish feed industry in the country so as to meet the needs in terms of quality feed;
  - enhance viable hatchery units so as to meet the needs in terms of quality seed;
  - enhance human technical capacity at all levels;
  - foster private sector investment in the sector;
  - support research along all the sector's value chains.
- The climate for private sector investment is good. There is political will to develop aquaculture industries, labour is available and affordable, there is a long coastline for mariculture, and good environmental conditions and a local market for aquaculture.

44. In the **South and Central Asia** region, Mr M.I. Golder, Director, Department of Fisheries, **Bangladesh**, advised the workshop of the following concerning aquaculture and inland fisheries in his country:

- Bangladesh is a small country with a high population density. People are dependent upon fish and annually consume 19.3 kg of fish per capita. The nation has a large area of inland waters. Aquaculture production comes mainly from ponds. There is immense potential to increase freshwater aquaculture in the floodplains.
- Aquaculture production has already increased 200 percent in the last 10 years, and it contributes 55 percent of the nation's total fish production. The number of species being farmed in freshwater totals 35. There is a shortage of quality seed for stocking ponds and other waterbodies, particularly for high-value species such as shrimp/prawn.
- There are opportunities to further increase fish production from ponds and oxbow lakes. Average annual fish yields from floodplains are currently at only 265 kg/ha; but it is possible to increase them tenfold through planned aquaculture and management.
- Community-based fisheries management of selected public waterbodies has been established around the country to provide support to waterbody restocking development projects. These projects are generally yielding good results, which has prompted the Government to consider community-based fisheries management as a sustainable approach to fisheries management.
- The Daudkandi model of public-private partnerships, in which the main stakeholders include the Government (Department of Fisheries, Local Government Engineering Department [LGED]), local communities, and NGOs, is being adopted in order to ensure that aquaculture project results are sustainable after direct Government or donor support.
- The benefits of aquaculture in the floodplains are recognized to be social as well as economic, and include employment generation, women's empowerment, and law and order improvement.
- A national aquaculture development strategy and an action plan are in place. Feed manufacturers and importers are receiving licences from the government and are required to be monitored regularly to ensure quality fish feeds for farmers.
- The main challenges to aquaculture in Bangladesh are adequate provision of technical assistance to so many farmers, good fish seed and fish feed, the intensification of non-traditional aquaculture systems such as cage culture, and updating the fisheries resources survey system. Bangladesh has relatively low aquaculture productivity on a per-hectare basis, needs to pay attention to the conservation of remaining natural environments, and place a priority upon adaptation to the projected effects of climate change.
- Institutional capacity building is at the top of priorities of aquaculture needs, followed by improved quality and quantity of aquaculture seed, feed, and food safety.

- Adoption of finfish cage culture, promotion of mariculture and brackish-water aquaculture, and intensification of aquaculture methods represent major opportunities for Bangladesh.

45. Mr Haing Leap, Deputy Director, Department of Aquaculture Development, Fisheries Administration, **Cambodia**, informed the workshop of the following:

- Cambodia is rich in biodiversity and has some coastline available for mariculture. Aquaculture and culture-based fisheries play an important part in nutrition and livelihoods. Wild capture from marine and inland waterbodies such as Tonle Sap and the Mekong River is 625 000 tonnes annually.
- A national aquaculture development strategy to 2030 has been developed. Cage and pen culture are the traditional and popular methods of farming fish, with ponds being adopted mainly since the 1960s.
- Cambodia has historically enjoyed a good supply of fish from freshwater capture fisheries, so aquaculture has become important only in the last 20 years. From 26 000 tonnes in 2005, aquaculture production rose to 120 055 tonnes in 2014. For the dry season period, community fish refuges (CFRs) are important for maintaining broodstock fish for the following wet season. Human resources in aquaculture include about 1 000 government staff.
- Cambodia has massive land and water resources that could yet be used for cage or pond culture of freshwater fish. Inland aquaculture is generally more successful than mariculture. There is a combination of indigenous and exotic species being cultured. Aquaculture is still small compared with capture fisheries, although it was worth about US\$240 million in 2014.
- Fisheries in total contributes 12 percent of national GDP. The Government's Fisheries Administration (FiA) is the lead agency. The National Aquaculture Research Development Institute (NARDI) undertakes research, and there are agriculture colleges that engage in training for aquaculture. In total, an estimated 20 000 people have received training in aquaculture.
- Aquaculture is identified in national planning as one of the critical activities to ensure food security in Cambodia. The main constraint is the supply of seed and feed. A complicating factor is that demand for seed, and for harvested fish, is highly seasonal, being driven by rainfall patterns and climate. This results in large seasonal fluctuations in fish prices. Flooding due to this climate is a direct threat to fish production.
- While development of aquaculture in Cambodia has not yet reached the level of other Asian countries, there is much scope for growth.
- There is a need for assistance in capacity-building, seed, feed, and water supply issues. There is also a big need for more efficient use and better on-farm practices in fish feeds.

46. Sharing the experience of **Indonesia**, Mr Coco Kokarkin Soetrisno reported that:

- Indonesia is implementing regulatory approaches to protect the environment, such as buffer zones along mangrove coasts, pond systems to include waste treatment ponds before discharge, adoption of integrated multitrophic aquaculture (IMTA) (such as sea cucumber stocked under finfish sea cages), and so on.
- Rice fish culture dates from 1860 and has expanded since the 1960s. It is done extensively, without feeding. However, with a population of 250 million people, now it is timely to intensify this culture practice. Indonesia is losing rice production area due to other developments, but both rice and fish are politically seen as vital for food security. Hence, the need for Indonesia to "get more from less".
- Problems stem from the land tenure system, and poor coordination of the departments of agriculture, fisheries and irrigation. The area under rice-fish cultivation is too small to initiate a permanent value chain. Intensive feeding represents 40–60 percent of production costs.
- Rice income is US\$2 100 per crop, but this income rises to US\$6 900 with tilapia fish added, adding a further US\$2 800 to the profit margin. Rice-prawn farming is even better, with US\$5 400 in profit. The latter type of culture has been a success story in central Java and in Lombok. African catfish are also good in paddy – they eat insect pests and even rats.

- With local government support, the area of uptake of rice-fish production is increasing in Indonesia. A new approach has been adopted, with intensive meetings with the Ministry of Agriculture. Joint interdepartmental contributions toward land, fish seed, rice varieties, irrigation water, etc., and adoption of less-water-use technologies in a collaborative approach have also been used. Indonesia's goal is now to attain 10 000 ha using such culture methods by the end of 2016. It is a good sign of interagency cooperation, guided by FAO in Jakarta. Indonesia needs to make this business attractive to young people in order to keep them engaged in farming. There is a range of social and environmental benefits such as less use of pesticides in order to protect the fish.
  - Indonesia loses between 100 000 ha and 120 000 ha in rice paddy area to aquaculture each year because rice farming gives only a small margin. In fact, most rice farmers expect government subsidies before they can start cultivating their land for rice.
  - Indonesia is facing a dilemma of increasing rice production, diminishing land area and the role of providing inputs to unenthusiastic farmers. By rice-fish practices, farmers have significant economic gains that prevent them from selling their land.
47. About **Kazakhstan**, Mr Serik Timirkhanov, Director, Sea Biology Ltd, indicated that:
- Kazakhstan has some internationally significant waterbodies for aquaculture, including part of the Caspian Sea, and nationally important lakes and rivers. These are snowed and often iced-up during winter, excluding the middle Caspian Sea. The Caspian Sea has strong winds. Ten fish species are farmed, mainly trout, common carp, grass carp, silver carp, trout and sturgeon. Activities include restocking of natural waterbodies without feeding, and pond aquaculture with feeding.
  - The markets for fish are local, national and regional. Carp sells for US\$3–3.5 kg for 3 kg fish. However, aquaculture is a very small contributor to national fish consumption. Kazakhstan has no institution devoted to aquaculture.
  - The main constraint is insufficient state support and the lack of a transparent state policy toward aquaculture.
48. Concerning **Uzbekistan**, Dr Bakhtiyor Karimov, Head of Laboratory, Scientific Consulting Centre "ECOSERVICE", shared the following information with the workshop:
- Very few fish farms existed in Uzbekistan prior to the 1960s. However, fish yields from the Aral Sea began to decline in early 1960s, which prompted aquaculture development as a response. About 2 000 workers are directly employed in aquaculture, and about another 2 000 indirectly, mainly in the Tashkent region. The total pond area is now about 15 900 ha, and the number of fish farms is 1 400. In 2014, total fish production from aquaculture was around 24 000 tonnes, compared with 5 100 tonnes in 2009.
  - Cultured fish species are silver carp, common carp, grass carp, bighead carp and crucian carp. Uzbekistan has also North African catfish (*Clarias gariepinus*) and Siberian sturgeon, both introduced recently. A scientific experimental station for fish culture development has started research work on the inclusion of European wels (*Silurus glanis*), Siberian sturgeon (*Acipenser baerii*) and pangasius (*Pangasius bocourti*) into aquaculture practices.
  - Cyprinids are mainly produced in large earthen ponds. The growing season is from March/April to October/November. It takes the fish two years to reach market size. Some farmers have recently invested in recirculation aquaculture systems (RAS) or cage culture systems.
  - The sector has undergone rapid growth very recently after the issuance of a three-year State programme on fisheries sector development in 2009. Today, it is seen as important to promote rural livelihoods, food security and improved nutrition, because 50 percent of the population is still rural. Aquaculture in Uzbekistan is a highly profitable industry and can help alleviate rural poverty.
  - The lead agency is the Main Administration for Animal Husbandry, Poultry and Fisheries of the Ministry of Agriculture and Water Resources (MAWR). There are region-level fish

farmer associations, but no national association. There are limited specialized education opportunities, research institution, or support for training of fish farmers for aquaculture in the country. The fish culture development centre (organized in 2003 under the MAWR) was merged with the institute of animal husbandry in 2014 in form of its scientific experimental station on fish culture development.

- In spite of the rapid growth in fish production volumes, per capita fish consumption in the country still remains very low at less than 1 kg/year. Technical assistance needs cover every aspect of aquaculture. Transfer of technical information from other countries with developed aquaculture is essential; there is a need for courses, manuals, training workshops, etc. The nation's top priority is fish feeds and feeding technologies, followed by fish seed production, and development of aquaculture rules and regulations, including on culture-based fisheries.
- There is an urgent need to develop intensive, water-saving aquaculture technologies, above all cage culture systems. However, this is not so simple because Uzbekistan needs to consider environmental impacts due to high pollution risks into its rivers and waterbodies. There is a need for care when speaking about intensification and diversification of aquaculture, given the deficit in freshwater resources in the country and the complicating factor of climate change. In wet years, some regions, for example the lower reach of the Amudarya River, can have more than 100 000 ha of waterbodies, but in dry years there will be only a few hundred hectares.

49. For **Central and Latin America**, Mr De Haan De Shay Delarue Brown shared the following information on **Jamaica**:

- Jamaican aquaculture is following an opposite trend to that of most other countries, with production now greatly reduced compared with that of recent years. Jamaica has a population of 2.7 million people. Jamaica's main industries are tourism, mining, banking and agriculture.
- Tilapia was commercialized in 1976 and production reached a peak of about 8 000 tonnes in 2008, but collapsed to 700 tonnes in 2012. In the boom years, growth was facilitated through a contractual arrangement with one large company, Aquaculture Jamaica Limited, forming the hub around which smaller growers were clustered.
- Inland aquaculture occurs in semi-intensive earthen ponds, at one crop per year using green water culture methods. The culture cycle consists of three phases, with methyl-testosterone treatment for one month, followed by nursery for 40–60 days, and then transfer to grow-out ponds for 189 days.
- Farmers obtain average annual yields of about 3 200 kg/ha. Farms are located on the south coast because this is away from tourist areas, the clay content of soils is higher, and on this side of the island there are more water resources due to an extensive irrigation system and flatter topography.
- The industry for red tilapia boomed for a time but has now collapsed. The first collapse was due to natural disaster (a series of hurricanes in 2004), but the second and more detrimental one was due to lack of competitiveness in export markets. Production dropped from 8 000 tonnes per year to less than 1 000 tonnes in 2014 (usually about 600 tonnes).
- All fish are now sold in local markets. There is no longer any central marketing system. Fish are sold mainly alive, followed by fresh chilled. Consumer preferences are for fish in the size range of 230–340 g. Jamaica imports US\$135 million of fish products annually, and exports US\$35 million of marine species only. Fisheries contribute 0.29 percent of GDP. Per capita fish consumption is 15.7 kg/year.
- In terms of institutional structure, there is an aquaculture branch within the Department of Fisheries, itself a part of the Ministry of Agriculture and Fisheries, which carries out training, extension, and research and development (R&D). Jamaica has eight main pieces of legislation that affect the fishing industry. There are five institutions directly and indirectly involved in research and training. While no degree programme in aquaculture is offered in Jamaica, there is a six-week course in aquaculture. Planning instruments include a fisheries and aquaculture



policy, a development plan (funded by FAO), and an action plan (funded by the European Union [Member Organization]).

- Constraints to Jamaica's aquaculture include:
  - Jamaica's tilapia genetic resources need review and possible replacement.
  - There is no broodstock management programme in place.
  - There is a need for the development of feed from local available material.
  - There is a need for design and management of seed stock production systems.
  - There is untapped scope for expansion of brackish-water and mariculture;
  - There is a range of other needs, similar to those of other less-developed small nations from around the world.
- Jamaica has had a good track record in aquaculture in the past. There is scope to revitalize the industry if attention is paid to lessons learned and to addressing the key needs that have been identified.

50. Talking about **Mexico**, Mr Giovanni Fiore Amaral, Deputy Director of Aquaculture, Sagarpa, Mexico, revealed that:

- Trout was the first species to be introduced for culture in Mexico. That was in the 1880s. In the following decades came mainly freshwater species such as catfish, tilapia and carp, while in the 1980s the first mariculture fish species were introduced, including pompano, snappers and sea bass, and shrimp with land-based aquaculture of tilapia. Today, the sector combines both freshwater and mariculture farming.
- About 56 000 people are registered in the national fisheries and aquaculture database, and aquaculture total production was almost 250 000 tonnes in 2013.
- There have been major economic losses in the shrimp industry due to viral diseases. In 2013, Mexico produced 60 000 tonnes of shrimp from aquaculture, which was only half of the annual production recorded during the previous five years.
- Tilapia is farmed throughout the country, and is a consistent performer at about 70 000 tonnes of production annually. Mexico also farms the catfish *Ictalurus punctatus* (about 3 000 tonnes) which is exported to the United States of America. There are 13 government hatcheries, producing fingerlings for small-scale farmers and for release into natural waterbodies.
- Abalone and various bivalve molluscs such as scallops and oysters are consistent performers in aquaculture. Between 2 000 and 3 000 tonnes of wild-captured tuna are "farmed" each year in holding facilities in order to improve their quality for foreign (including Japanese) markets. Mexico is looking into diversification of mariculture of other finfish, and sea cucumber and other invertebrates.
- Through the National Commission for Aquaculture and Fisheries, aquaculture is in the process of institutional reorganization, to become a separate department (directorate).
- Institutional support is generally good. For example, following atypical high mortality in the shrimp industry in 2014, the National Commission for Aquaculture and Fisheries offered shrimp insurance to the industry and provided funds for strategic development of aquaculture. Mexico has good tertiary education opportunities in aquaculture.
- Mexico has all of the hallmarks of a mature aquaculture industry. The nation has achieved stable production with economies of scale although shrimp diseases continue to plague the industry.
- In spite of this development, fish consumption nationally remains low, at only 10 kg per person, and there is low consumer preference for freshwater fish. The National Commission for Aquaculture and Fisheries is working on strategies to boost fish consumption. Locally produced fishery products are sold at affordable prices in Mexico. Diversification into new high-value marine species is ongoing and poses research challenges. There is low production of seed.
- Overall, Mexico itself has a lot to share, in terms of technology, with other developing countries.

## **PARTNERS ' PRESENTATIONS ON THEIR WORK PRIORITIES AND HOW PROGRAMMES RELATED TO FISHERY AND AQUACULTURE CAN CONTRIBUTE TO FOOD SECURITY AND RURAL DEVELOPMENT**

51. This session was chaired by Dr Nathanael Hishamunda, Senior Aquaculture Economics, Policy and Planning Officer, Fisheries and Aquaculture Resources Use and Conservation Division, FAO, Rome, Italy. Dr Timothy Pickering, Secretariat of the Pacific Community (SPC), was the rapporteur.

52. Presentations were made by representatives of the Aquaculture Network for Africa (ANAF), Network of Aquaculture Centres of Asia-Pacific (NACA) and Secretariat of the Pacific Community (SPC). Summaries of these presentations are presented below.

53. In his presentation on ANAF, Dr Nathanael Hishamunda, informed participants that:

- The decision to establish ANAF, a “NACA-like” network for Africa, was taken at the fourteenth session of the Committee for Inland Fisheries and Aquaculture (CIFAA) in Accra, Ghana, in November 2006, which indicates that ANAF is a subsidiary body of CIFAA. However, it was the fifteenth session of CIFAA meeting in Lusaka, Zambia, in 2008, that effectively established ANAF;
- As of 2015, ANAF has 13 member countries, all from sub-Saharan Africa, compared with 37 for CIFAA. For a country to become a member of ANAF, it has to be a member of CIFAA first. The minister in charge of aquaculture in this country has to address a letter to CIFAA’s technical secretary requesting membership of ANAF.
- In terms of its goals, ANAF was created in order to:
  - respond to the increasing development of aquaculture in the region;
  - facilitate scientific and technical information exchange in aquaculture;
  - promote regional and subregional collaborative aquaculture research;
  - organize training of fish farmers and extension workers;
  - promote and facilitate technology transfer between countries;
  - assist the private and public sectors to have quick and easy access to information required for decision-making;
  - respond to the increasing public demand for transparent and accurate information concerning aquaculture.
- Regarding accomplishments:
  - ANAF has trained national focal points (NFPs) in data collection and treatment;
  - ANAF’s NFPs have met five times to discuss programmes of work and other issues including the ANAF-IGO transformation process.
  - the last meeting of ANAF member countries was held in Dakar, Senegal, in September 2013.
  - a parallel web-based information system has been developed and it is hosted by the Lake Victoria Fisheries Organization (LVFO) in Jinja, Uganda.
- As to ANAF’s constraints:
  - Accomplishment of the network’s objectives is hampered by:
    - inadequate political will on the part of governments;
    - the consequent lack of financial contributions by governments.
  - Seven years after its creation, ANAF still does not have a secretariat or premises of its own; the Aquaculture Branch of the FAO Fisheries and Aquaculture Department provides secretarial support while the LVFO provides office space.
  - ANAF financing is external and ad hoc; surviving on FAO’s support through TCP and non-TCP projects such as the NFFP (NEPAD-FAO Fish Programme).
- The way forward is to:
  - turn ANAF into a functional Intergovernmental Organization (IGO);

- draft the ANAF founding agreement along with a legal framework, which implies:
  - drafting a charter for countries to agree upon and adhere to;
  - identifying national legal procedures towards presenting and adopting international agreements.
- identify a prospective host government (find ANAF a home), implying the need to:
  - define criteria for host country selection (political stability; internal security; commitment towards aquaculture development);
  - define host country's obligations (provision of, at least, office facilities);
  - recognize benefits to host country (employment; indirect benefits to country's economy);
  - present the agreement to the Conference of African Ministers of Fisheries and Aquaculture (CAMFA).

54. Mr Cherdasak Virapat, Director-General of **NACA**, notified the workshop that:

- NACA is an intergovernmental agency funded by contributions from member governments stretching from Iran (Islamic Republic of) through Central Asia, South Asia, Southeast Asia and the Pacific to Australia. In total, there are 19 full members, plus the SPC as an associate member on behalf of Oceania microstates. NACA links together five regional lead centres which include FFRC in Wuxi, China.
- NACA undertakes a range of activities arranged under five thematic programmes; animal health, emerging global issues including climate change, food safety and certification, genetics and biodiversity, and sustainable farming systems.
- There are three crosscutting programs: education and training, gender, and information and communications. NACA carried out a SWOT analysis in 2014, in which South-South Cooperation was identified as one of the organization's "opportunities".
- NACA planning anticipates three "priority strategic foresights": sustainable intensification of aquaculture, broodstock quality (for example, does inbreeding amplify shrimp disease?) and aquaculture governance. NACA members can share experiences on resilience to climate change, particularly Bangladesh and Nepal.

55. Presenting the **Secretariat of the Pacific Community (SPC)**, Dr Timothy Pickering advised the meeting that:

- The SPC is an intergovernmental organization of Pacific islands countries and territories (PICTs) with headquarters in Noumea, New Caledonia. It offers technical advice to members across a range of sectors including fisheries and aquaculture, and is an associate member of NACA.
- Pacific islands aquaculture will always be small by global standards; however, within microeconomies, a small amount of aquaculture can have a big impact on people's lives. There are clear aquaculture successes in the Pacific region, and much scope for growth owing to the favourable climate and abundance of aquatic locations for aquaculture.
- The Pacific has been slow to turn "potential" into "production" for a range of reasons. Availability of farm inputs is a major constraint (feed, seed, capital, equipment and trained people). Export markets are distant, domestic markets are relatively small (there are some exceptions, e.g. Fiji, Papua New Guinea), marine finfish remains technically difficult, and indigenous freshwater finfish have marine ancestries with complex life histories that make them a challenge to domesticate for aquaculture.
- While PICTs do have high biodiversity with many unique species, export markets are largely unfamiliar with them. Aquaculture governance needs to be improved in PICTs. Small-scale household-level aquaculture for subsistence consumption is only viable with ongoing government support and subsidy of farm inputs. Even so, household aquaculture for food security is seen as important and most governments have programmes to support it.

- The next challenge is to add a layer of viable SME-scale commercial-market aquaculture for periurban markets in the PICTs. The lessons from Asia and Africa, if they can be applied to the Pacific via mechanisms of South-South Cooperation, will greatly help to ensure that the contribution of aquaculture to food security, livelihoods, climate change adaptation and exports in the Pacific region continues to increase.

## **DEVELOPING PROPOSALS RELATED TO A MULTIPARTNER PROGRAMME ON FISHERIES AND AQUACULTURE FOR FOOD SECURITY AND RURAL DEVELOPMENT IN DEVELOPING COUNTRIES**

56. This session was chaired by Dr Nathanael Hishamunda. Dr Timothy Pickering was the rapporteur.

57. In setting the scene for this workshop agenda item, Mr Liu Zhongwei, FAO-China South-South Cooperation (SSC) Programme Coordinator, informed the workshop of the following:

- There are two kinds of SSC: multilateral, and bilateral. China has many examples of the latter already. FAO's SSC initiative was launched in 1996. In 2006, a letter of intent was signed with China. China has since donated in total US\$80 million to a trust fund to support SSC by FAO. China's support is thus twofold, because it includes financial support as well as technical support.
- At the end of 2014, China has 12 SSC country projects, 2 global projects, 10 host countries, 8 capacity development initiatives, had committed 225 of its staff (many are long-term in the field), and had held 1 high-level forum on SSC achievements. More than 400 development solutions were delivered to host countries. Programme achievements in agriculture and aquaculture include: improved food security – introduction of new high-yielding varieties and advanced culture techniques; formulation of development strategies and policies; and smallholder livelihoods (including women) improved.
- Based on the successful Phase I SSC, China's Premier Li Keqiang visited FAO headquarters in Rome in 2014 and announced China's commitment to a Phase II via a new pledge of US\$50 million to FAO for SSC. The goal of Phase II is to eradicate hunger and poverty by contributing to FAO's strategic objectives. Outcomes sought will be to: extend the SSC to additional countries and regions; scale up the achievements of Phase I; increase networking with China's institutions; promote agribusiness; and develop sustainable business models for value adding, trade and investment in agriculture.
- Key principles for Phase II, based upon lessons learned from Phase I, are to: scale up the successes of Phase I; support FAO's Strategic Objectives (SOs) and Regional Initiatives (RIs) in alignment with China's strategic objectives; choose activities that will be sustainable in the long run; develop flexible SSC modalities and seek wider partnerships including triangular arrangements, implement demand-driven programs aligned with the Country Programming Framework (CPF); and focus on low-income food-deficit countries (LIFDCs).
- Expertise: China will work through the successful modality of long-term deployment of expertise, for periods of 2–3 years, and promotion of easily adaptable and affordable technology. Field demonstrations through learning by doing will foster day-to-day interactions with local farmers and extension officers. In general, assignments should cover at least two agricultural seasons. All stakeholders should confirm their political commitment, because technology leads nowhere without high-level political commitment and support.
- Innovations: On a demand basis, China will assist countries to formulate development plans. It will organize high-level policy fora to exchange SSC experiences, and promote investment in support of improved and inclusive value chains. Phase II will support capacity development through networking between national and Chinese institutions, and training of host-country trainers in China.

- FAO Reference Centres: These will conduct research on SSC development, and collect best experiences.
- Phase II will focus on Africa, Latin America and Asia, including Pacific islands. Special effort needs to go into developing modalities to engage with Pacific islands, because of their different size and scale compared with other regions.
- The procedure to submit proposals for SSC activities was described, along with the roles and responsibilities of FAO, China and host countries.

58. The institutional structure, priority objectives, and collaborative arrangements of CAFS were presented by Dr Ma Zhuojun, Division of International Cooperation. The meeting was provided with a summary profile of aquaculture in China, along with its problems and challenges.

59. To address the issue “How to build a sustainable developing aquaculture industry?”, CAFS has built up programmes in the following areas: multitrophic open-water systems (scallops, finfish, seaweeds, abalone); application of ecological engineering principles to the design and construction of ponds; recirculating aquaculture systems (RAS); selective breeding; and management of the industry. Ideally, CAFS recommends using native species for aquaculture, and developing technologies based upon local systems. What works in China might not always be suitable for other countries.

60. In CAFS’ view, international cooperation is vital for sustainable development of global aquaculture. CAFS possesses technical innovations and experiences in a number of technical and policy areas. CAFS can offer a platform for international cooperation and communication in aquaculture.

61. Ms Yu Yang, Director, **CICOS**, presented the Review of Capacity Building Activities under the Framework of South-South Cooperation, supported by the FAO-China Trust Fund, in which she shared the following information with workshop participants:

- The Inauguration Seminar and Partner Conference of Tropical Agriculture Platform (TAP) was held in Hainan, China, from 4 to 6 September 2013. Representatives from FAO headquarters, the International Centre for Tropical Agriculture and other regional research institutions, and 45 representatives attended the seminar. The capacity-building requests of developing countries in tropical agriculture were presented. The seminar outlined the action plan and responsibilities of TAP and elected new members of the steering committee. The convening of this seminar honoured China’s commitment at the G20 summit.
- Training course on aqua-feed and aqua-seed production in Central Asia; CICOS and Freshwater Fisheries Research Centre (FFRC) jointly held a training course on aqua-feed development and aqua-seed production in 2013. The training was a follow-up programme for the Seminar on Regional Cooperation Programme for Responsible Aquaculture and Fisheries Development in the Central Asian and Caucasian Countries, held in Xinjiang Autonomous Region, China, in 2012. A total of 19 participants from Azerbaijan and 9 other countries attended the training course.
- The High Level Workshop (HLW) on Sustainable Improvement of Rice-Value Chain and Capacity Development for Hybrid Rice Integration in Africa was held at the Hunan Hybrid Rice Research Centre (HHRRC), China, from 23 to 27 June 2014. Thirty-seven representatives from 19 international organizations, government agencies and national research institutions attended the workshop. Participants reviewed rice production strategies in African countries, discussed integration of hybrid rice development into important regional and subregional priority programmes, and identified African countries with appropriate conditions for developing hybrid rice. A road map for hybrid rice development in Africa in the next five years was elaborated, which states the duties and responsibilities of participating parties, and the steps to be taken to promote hybrid rice development in African countries. Nineteen representatives attended the three-week Training Course on Comprehensive Capacity Building for Hybrid Rice Development that followed the HLW.

- The High-Level Dialogue (HLD) on Promoting Smart Energy for Food Security and Rural Development in Developing Countries was held from 27 to 30 October 2014 in Dujiangyan, Sichuan Province, China. More than 50 representatives from Botswana, Cambodia, Costa Rica, Indonesia, the Lao People's Democratic Republic, Mozambique, Myanmar, Thailand, Viet Nam and Zambia, and experts from FAO headquarters and China participated in the HLD. The representative from China shared the country's experience in developing and utilizing biogas. An action plan for promoting smart energies in developing countries was drafted. Prior to the HLD, 19 representatives from 6 developing countries attended a two-week training course on rural energy technology at Biogas Institute of China's Ministry of Agriculture.
- The first training course on Globally Important Agricultural Heritage Sites (GIAHS) was held from 23 to 28 September 2014, cohosted by FAO and China's Ministry of Agriculture, and was attended by 23 representatives from agricultural institutions of 12 Asian-Pacific countries. The ideals and the importance of protecting of GIAHS were introduced; along with experiences and challenges China has faced in protecting agricultural heritage. An action plan for launching, exploring and applying for GIAHS was drafted.

62. Workshop participants split into two groups. Group 1 included Africa, Latin America and the Caribbean. Group 2 comprised Southeast Asia, Central Asia and the Pacific. The goal was to discuss and agree on regional capacity development needs and priorities, and map them against the capacity that the Government of China can provide through CAFS. These needs and priorities appear in Appendix 8.

63. These needs and priorities were then used to define proposals and to agree on the next steps including a road map and milestones. These regional proposals are reported in Appendixes 9 and 10.

## FIELD VISIT

64. A half-day field trip on the third day took participants to Hai'an city, Jiangsu Province, to visit the Zhongyang fish farm. Zhongyang farm is a comprehensive fish farm equipped with an indoor recirculation system, quality control, well-designed standard open pond system and an ecotourism park. The major species cultured there are high value, and some are endangered species, such as puffer fish, American shad, sturgeon, crocodile, suckerfish (*Myxocyprinus asiaticus*), roughskin sculpin (*Trachidermus fasciatus Heckel*), and giant salamander (*Maccullochella pealii*).

65. The farm was established in 1988 as an intensive eel farm at the tide zone of the Yellow Sea. In 1993, with its own money and the support of the Chinese Government, the farm started to culture and breed high-value fish of the Yangtze River, protect endangered species, and contribute to the responsible utilization and conservation of fishery resources.

66. After 20 years of development, Zhongyang farm is working on puffer fish breeding and aquaculture and set for scaled, industrial and market-oriented development. Currently, the farm has 100 ha of land area, of which 50 ha of pond are for grow-out farming, and 150 000 m<sup>2</sup> cover indoor aquaculture system. The farm features high intensification, low energy in water purification, fish nutrition, feed development and breeding. Currently, it produces more than 12 million puffer fish and 50 000 *Coilia* per year.

## CONCLUSIONS AND RECOMMENDATIONS

67. Participants were unanimous in stating that they were fully satisfied with the workshop. They expressed their gratitude to the organizers for their financial and excellent logistical support, and to FAO, especially the Chairperson, for their dexterous leadership in conducting the workshop.

68. The workshop noted the need for swift implementation of its outcomes, in particular, the meeting:

- Recommended that FAO develop “project concept notes” produced by the workshop into fully fledged projects for financing soonest;
- Recommended that FAO (TCS) send “project request forms/templates” to workshop participating and non-participating countries in order for them to submit requests for project funding to FAO.
- Requested FAO (TCS) to clarify to countries the step-by-step process to follow when requesting a project within the South-South Cooperation framework.
- Requested the Government of China to establish a “credit line for aquaculture development in developing countries, especially for Africa”. The goal is to make it easier for Chinese entrepreneurs wishing to invest in aquaculture in Africa or elsewhere in developing countries to access the much-needed capital (loans) in China for investment in Africa and elsewhere, in the form of joint ventures.
- Requested the workshop organizers to organize a workshop on “investment and partnership opportunities in aquaculture in Africa” in the framework of FAO-China South-South Cooperation. This meeting would be held in a sub-Saharan African country with attendance of Chinese entrepreneurs and participants from other sub-Saharan African countries. After the workshop, a field visit in the host country and study tour in other countries will be organized for the Chinese entrepreneurs in order for them to appreciate investment opportunities in these countries.
- Requested workshop organizers to organize similar workshops in other South-South Cooperation countries or regions as appropriate.
- Requested workshop organizers to facilitate partnership/joint-venture opportunities with China, through, for example, providing developing countries with clear guidelines (step-by-step) procedures/mechanisms as to how to initiate such partnerships between Chinese entrepreneurs and host countries’ potential investors.
- Requested that the South-South Cooperation scheme find other practical ways of promoting and supporting aquaculture as a business which attracts investments, and ensures participation by women and youth to pull them out of the state of hunger, unemployment and poverty.
- Recommended that the organizers create a network where all parties involved (FAO, China, South-South Cooperation participating countries) can share information, using the CAFS platform.

## **ADOPTION OF THE REPORT**

69. Subject to incorporation of the comments and corrections discussed in the final session of the Plenary, the report of the workshop was adopted on 5 June 2015.

## **CLOSING REMARKS: END OF THE INTERNATIONAL HIGH-LEVEL WORKSHOP**

70. Dr Hishamunda invited Dr Bakhtiyor Karimov, Head of Laboratory, Scientific Consulting Centre “ECOSERVICE”, Uzbekistan, to say a few words on behalf of the workshop participants. Mr Karimov thanked the workshop organizers for sponsoring the workshop and for the very warm welcome offered to all participants. He also expressed his gratitude to FAO for chairing the meeting in an effective and friendly manner, and called on the organizers to speed up the implementation of the conclusions of the workshop for the meeting to reach its intended ultimate goal.

71. On behalf of FAO, Dr Hishamunda commended the co-organizers, namely the Ministry of Agriculture, Government of China, CICOS, Bureau of Fisheries, CAFS and FFRC, for the excellent organization and hospitality. He also extended his appreciation to all participants for their active and frank discussions during the workshop as well as for their support throughout the week. He indicated

that without the unfailing hospitality of the organizers, the invaluable support and rich contribution of participants, the workshop would not have experienced the level of success it had achieved. Before wishing participants a safe journey back home, Dr Hishamunda assured them that FAO, in collaboration with the workshop organizers, would ensure that due follow-up actions in line with the recommendations of the workshop are taken in due course in order to make certain that the report of the workshop is a tool to drive aquaculture forwards in developing countries.

72. Mr Ji Wenyuan, Deputy Director-General, CICOS, Ministry of Agriculture, Government of China, expressed his full satisfaction as to the way the workshop had been conducted and the results achieved. In this regard, he indicated that the aim of the workshop of sharing experiences in inland fisheries and aquaculture among developing countries, understanding the constraints, and formulating plans for cooperation to address future challenges had been fully achieved. He extended his heartfelt gratitude to FAO, especially to the chairperson, for their leadership in achieving these results and conducting the workshop in a friendly and effective atmosphere, expressed his appreciation to all delegates for their extensive and rich participation in debates and thanked colleagues from the Bureau of Fisheries, Ministry of Agriculture, CAFS and FFRC for tirelessly working towards the success of the workshop. He then wished everyone a safe journey home and declared the workshop closed.



## AGENDA

DATE/TIME	ACTIVITY	REMARKS
<b>DAY 1</b> <b>(1 June)</b>	<b><i>Setting the scene on “Sustainable Aquaculture and Fisheries for Food Security and Rural Development”</i></b>	
08:30–09:15	Registration	
<b>Session 1</b> <b>(Plenary)</b>	<b>Opening Ceremony</b>	<b>Chair: FAO Matthias Halwart</b>
09:15–09:25	Welcome address	Jia Jiansan, Deputy Director, Fisheries and Aquaculture Resources Use and Conservation Division, FAO, Rome, Italy
09:25–09:35	Welcome address	Ji Wenyuan, DDG of Centre of International Cooperation service (CICOS), MOA, China
09:35–09:45	Remarks by Bureau of Fisheries	Li Shumin, DDG of Bureau of Fisheries
09:45–09:55	Remarks by CAFS	Zhang Xianliang, President of CAFS
09:55–10:10	Introduction of participants	All participants
10:10–10:30	IHLW Overview: Rationale and Objectives	Matthias Halwart, Senior Aquaculture Officer, FAO, Rome, Italy
10:30–10:45	Group photo	All participants
<b>10:45–11:00</b>	<b><i>Coffee break</i></b>	
<b>Session 2</b> <b>(Plenary)</b>	<b>Overview on how sustainable fishery and aquaculture can contribute to food security and rural development</b>	<b>Chair: FAO Nathanael Hishamunda</b>
11:00–11:30	Keynote address: World sustainable fisheries and aquaculture development and its contributions to food security and rural development	Jia Jiansan/FAO
11:30–11:50	Overview of Achievements and Challenges in China’s experience on fishery and aquaculture	Mr Li Shumin, DDG of Bureau of Fisheries
11:50–12:10	Freshwater fishery industry system in China: achievements, constraints and prospects	Dr Ge Xianping Chief Scientist of MOA
12:10–12:30	Aquaculture development in the Asia-Pacific region-trends, issues and needs	Weimin Miao/FAO
12:30	Housekeeping/Logistical arrangements	
<b>12:30–13:30</b>	<b><i>Lunch break</i></b>	
<b>13:30–14:20</b>	<b>Country presentations on their situation, needs, challenges and opportunities on aquaculture for food security and rural development (10 minutes each)</b>	<b>Chair: FAO Nathanael Hishamunda</b>
	Participating Countries	Country Representative
14:20–14:35	General Discussion	
<b>14:35–15:25</b>	<b>Country Presentations on their situation, needs, challenges and opportunities on aquaculture for food security and rural development-cont’d (10 minutes each)</b>	
	Participating Countries	Country Representative
15:25–15:40	General Discussion	
<b>15:40–16:00</b>	<b><i>Coffee break</i></b>	

16:00–17:15	<b>Partners’ Presentation on their work (priorities and programmes) related to fishery and aquaculture for food security and rural development (10–15 minutes each)</b>	<b>Chair: FAO Nathanael Hishamunda</b>
	NACA	NACA Representative
	SPC	SPC Representative
	ANAF	ANAF Representative
17:15–17:30	General Discussion	
17:30	Closing remarks and end of session	Chair
<b>DAY 2</b>	<b><i>Developing proposals related to a multi-partner Programme on “Sustainable Fishery and Aquaculture for Food Security and Rural Development in Developing Countries”</i></b>	
<b>Session 3 (Plenary)</b>	<b>Towards a Collaborative Programme on “Sustainable Fishery and Aquaculture for Food Security and Rural Development in Developing Countries”</b>	<b>Chair: FAO Nathanael Hishamunda Rapporteur: Tim Pickering Moderator: Augusto U. SO</b>
09:00–09:15	Introductory remarks-Setting the scene	Chair
09:15–09:45	The FAO Strategy on South-South Cooperation	FAO (Liu Zhongwei)
09:45–10:45	Briefing introduction of CAFS and cooperation priorities/CAFS (Brainstorming on needs, challenges and opportunities related to the Programme in developing countries)	Ma Zhuojun, Moderator
<b>10:45–11:00</b>	<b><i>Coffee break</i></b>	
11:00–11:10	Setting the scene for the Mapping Exercise	FAO/Zhou Xiaowei and Li Jilong
11:10–12:30  Breakout sessions in 2 groups	<b>MAPPING EXERCISE-Identifying the capacity development needs and map those against the providers within China under CAFS</b> Note: Countries will work in 2 groups Group 1: Africa, LAC, China Group 2: Asia, Pacific, Central Asia & Caucasus, China Note: The discussion on China would concern support to developing countries through the SSC Cooperation programme as well as work in China	Each group has to appoint a Chair and a Rapporteur Group 1: Chair G.F. Amaral, Rapporteur M. Maurihungirire Group 2: Chair C. Virapat, Rapporteur M I Golder
<b>12:30–13:30</b>	<b><i>Lunch break</i></b>	
13:30–16:30 Breakout sessions in 2 groups	<b>Brainstorming MAPPING EXERCISE- Identifying the capacity development needs and map those against the providers within China under CAFS-cont’d</b>	FAO/China SSC Program FECC, Capacity Building Activities/CICOS
16:30–17:00	Group reporting to plenary	Chairs/Rapporteurs of Group 1 and 2
<b>DAY 3</b>		
<b>DAY 3 morning</b>  09:00–09:15	Setting the scene <b>Preparation of draft outline of programme proposals for each region</b> Note: Development of proposals on aquaculture integration into regional and country programmes (break-up session continued)	FAO/Liu Zhongwei  Group Chairs/Rapporteurs
<b>DAY 3 afternoon</b>	<b>FIELD TRIP</b>	

<b>DAY 4</b>	<b><i>Presenting outlines of recommendations and proposals and agreeing on next steps including a roadmap with milestones</i></b>	<b><i>Chair: FAO/Nathanael Hishamunda Moderator: Liu Zhongwei Rapporteur: Tim Pickering</i></b>
09:00–10:30	Presentations by Groups 1 and 2 on draft proposals on regional/sub-regional programmes	Group Chairs/Rapporteurs
<b><i>10:30–10:45</i></b>	<b><i>Coffee break</i></b>	
10:45–11:30	General discussion	
11:30–12:15	Brainstorming and agreement on next steps	FAO/Liu Zhongwei
<b><i>12:15–13:30</i></b>	<b><i>Lunch break</i></b>	
13:30–17:00	Report writing by Rapporteurs and Secretariat	Rapporteurs and FAO Secretariat
<b>DAY 5</b>		
0900–12:30	Report writing by Rapporteurs and Secretariat (continued)	Rapporteurs and FAO Secretariat
<b><i>12:30–13:30</i></b>	<b><i>Lunch break</i></b>	
13:30–16:00	Report writing by the Secretariat (continued)	Rapporteurs and FAO Secretariat
16:00–16:30	Participants' feedback	Participants
16:30–17:00	Adoption of the Report Closing remarks End of the IHLW	FAO/Country Representative/ MOA China

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**OPENING STATEMENT OF MR JIANSAN JIA, DEPUTY DIRECTOR, FAO FISHERIES  
AND AQUACULTURE RESOURCES USE AND CONSERVATION DIVISION**

*Distinguished guests and participants,  
My dear friend, Professor Xu Pao and his team in the Centre,  
Ladies and gentlemen,*

It is really a great pleasure for me to lead the FAO team to attend this important workshop on FAO/China South-South Cooperation Programme on Fisheries and aquaculture that is being organized jointly by FAO and the government of China. First of all, on behalf of FAO, I would like to express our grateful thanks to the government of China for its generous support in the past to provide assistances in capacity building in the field of fisheries and aquaculture in developing countries, and to host and fund this workshop on 1–5 June and the successive training on 6–20 June 2015 on aquaculture seed and feed development for the central Asian and Caucasian countries. I would also to take the opportunity to express my special thanks to our colleagues in the Freshwater Fisheries Research Centre in Wuxi, who have been working behind the scene to provide technical and logistic supports to both events.

*Colleagues,*

Aquaculture is being seen as the most possible and reliable source of fish supply in future to fill up the gap between supply and demand for fish with for the world with the growing population and the levelling-off of the capture fisheries production. Aquaculture development in recent years has not been evenly distributed geographically. The need to increase the capacities of developing countries for aquaculture development has been well recognized in recent global fora such as the meetings of the FAO Committee on Fisheries and its Sub-Committee on Aquaculture. Specific geographical regions of the world were particularly identified for urgent assistance, namely, the Africa, the Latin America and the Caribbean and the central Asian and Caucasian countries.

FAO has been working with the government of China through FAO-China South-South Cooperation Programme in capacity development in developing countries in the field of fisheries, especially aquaculture. So far, the programme has covered 9 countries and provided technical assistance in agriculture, animal husbandry, fisheries and aquaculture development in its first phase since 2009, with a total of US\$ 30 million Trust Fund contributed by the Government of China. In aquaculture alone, near 30 experts have been fielded 6 countries (Mali, Malawi, Senegal, Uganda, Liberia and Mongolia) to help aquaculture development. Besides the SSC country projects, the FAO-China SSC Programme also supported 70 participants to attended 3 aquaculture capacity development events in China. Under the 2<sup>nd</sup> phase of the Programme, aquaculture has also been identified as one of the priority areas to be supported.

FFRC is one of the five agriculture centres in China that have been formally by FAO as the reference centre of excellence in support of capacity development under the FAO/China SSC programme. Through training and technical assistance, the FFRC strives to increase the availability of accessible technologies in the field of fisheries/aquaculture from China to developing countries. Since the early 1980s, the centre has devoted itself to international training of technical and managerial personnel in various fields of inland fisheries and aquaculture research, extension, training, management, conservation and production. The FFRC has conducted (including through the SSC Programme) a great number of international training courses on integrated fish farming and other subjects related to sustainable fisheries and aquaculture development since 1981, and has trained more than 2 000 technical personnel in aquaculture technologies and management from 110 countries covering different geographical regions. Sharing of the Chinese technologies and experiences in sustainable inland fisheries and aquaculture development and management, including integrated fish farming practices, has greatly promoted and enhanced aquaculture and inland fisheries in many developing

countries. In line with FAO's mandate, the designation of FFRC as a Reference Centre is on the basis of the global recognition of the Centre's capacities and notable achievements on aquaculture. Under the terms and conditions of the designation agreement, FFRC is expected to provide technical/scientific advice on issues that are of notable relevance for FAO Member Countries and will facilitate the mobilization of a large range of scientific, technical and economic expertise within the Organization.

The workshop that we are to devote working together in the next few days aims at developing an agenda for action to promote sustainable inland fisheries and aquaculture development for food security and rural development in developing countries, and to identify the most urgent needs and challenges in less aquaculture developed countries and how these can be addressed through South-South Cooperation, especially the FAO-China SSC Programme. It will focus on developing a capacity development technical proposals and a five-year action plan for meeting the needs of participating developing countries.

*Dear participants,*

We may all have heard about the famous Chinese scholar, named FAN LI, who wrote the very first book on aquaculture in the world entitled "Pisciculture" which described carp culture in earthen ponds in China during the 5<sup>th</sup> century B.C. You would not believe it that the book in fact was written here in Wuxi, and this is why Wuxi has been considered the historic place where aquaculture had originated as a commercial activity in human civilization. It happened that the venue where we are having our workshop is a few blocks away from historic spot where there is museum devoted to origin of aquaculture and the Scholar Fan Li. the Freshwater Fisheries Research Centre of the Chinese Academy of Fishery Sciences (FFRC) is located in Wuxi and it has substantial relevant experience in aquaculture and fisheries training and advisory services in both of these subject areas, and also there are many fish farms around this region, and therefore, it would be an ideal place to stimulate our workshop discussion and aspiration. I hope you will take the opportunity and make your stay a successful and meaningful experience. Many of you also have been working in this field for years and accumulated a lot of experiences, and I hope it would be a good opportunity for you also to share your experiences and lessons learnt from your respective countries among your fellow trainees as well as the colleagues in the centre.

I wish you all a great success and an enjoyable stay in Wuxi.

Thank you.



**OPENING STATEMENT OF MR JI WENYUAN, DEPUTY DIRECTOR-GENERAL,  
CENTRE OF INTERNATIONAL COOPERATION SERVICE, MINISTRY OF  
AGRICULTURE, GOVERNMENT OF CHINA**

*Dear Friends, Ladies and Gentlemen,*

Good morning,

Based on the minutes of the 4<sup>th</sup> China-FAO Annual Consultation Meeting and the work schedule of 2015 Trust Fund Capacity Building, China-FAO International High-level Consultative Expert Workshop on Sustainable Development of Aquaculture and Inland Fishery which is jointly organized by Chinese government and FAO is now held in Wuxi of Jiangsu province. This workshop aims to share experiences in inland fishery and aquaculture among China, FAO, and other countries, to understand their current status and needs, to comprehend aquaculture developing trends, constraints and prospective, and to forge future cooperation schemes in meeting new challenges under new situations. About 30 experts and representatives from national fishery sectors, and regional organizations of Asia-pacific, Africa, Latin America and Caribbean regions, international organizations and Chinese government are here attending the workshop.

Entrusted by International Cooperation Department of MOA, I would like to extend my warm welcome to all officials and experts here, to express my heartfelt gratitude to FFRC of CAFS which provides technical support to this workshop, and sincere congratulations on the successful opening of the workshop.

With the continuous increasing of world population, consumption demand for agricultural products, such as grain, are also expanding. Yet, besides the traditional constraints from soil, water resources, etc., global agriculture is also facing new challenges from climate change, bio-energy, grain price fluctuation, environmental protection, etc. Food security and sustainable agriculture development are always the common challenges for all human beings. China is a big country for agriculture, as well as for aquaculture. Inland fishery and aquaculture has been playing a very important role in increasing fish supply and guaranteeing food security. Meanwhile, high attention is now attaching to the efficient protection and sustainable utilization of fishery resources, and the impact of aquaculture on eco system. With this workshop, I hope effective methods for constructing sustainable fishery and aquaculture could be probed out.

For the success of this workshop, MOA of China, FAO and FFRC have actively collaborated with each other and did lot in communicating and coordinating; meanwhile, leaders of CAFS and FFRC have attached high importance to the workshop and provided the delegates with comfortable working and living conditions; my sincere gratitude goes again to all of them.

Finally, wish all friends have a good health, fruitful work and pleasant stay in Wuxi.

Thank you.

**OPENING REMARKS OF LI SHUMIN, DEPUTY DIRECTOR-GENERAL, BUREAU OF FISHERIES, MINISTRY OF AGRICULTURE, GOVERNMENT OF CHINA**

*Distinguished Guests, Dear Friends, Ladies and Gentlemen,*

Good morning,

Today, China-FAO International High-level Consultative Expert Workshop on Sustainable Development of Aquaculture and Inland Fisheries kicks off in Wuxi, a city with picturesque sceneries and the name as “pearl of Taihu Lake”. At this occasion, on behalf of Bureau of Fisheries, MOA, I’d like to express my appreciation for your coming, and my heartfelt gratitude to all the representatives and experts for your caring and supporting China’s fishery development.

China is a major country of aquaculture. Its aquaculture production surpassed capture output in 1990 for the first time, becoming the only country whose aquaculture production exceeding capture production among world major fishery countries. In 2014, China’s aquaculture production reached 47.484 million tons, accounting for 63 percent of the world’s aquaculture production. Since 2002, China has become the world’s leading exporter of aquatic products, exporting volume accounting for more than 10 percent of total production. China’s fast development of aquaculture has contributed a lot to world fishery product supply. According to FAO, world’s per capita supply of aquaculture products increased from 0.7 kg in 1970 to 7.8 kg in 2008, increased by more than 10 times. China’s contribution to world food security cannot be ignored. In 1994, the US scholar Mr Lester Brown shook the world with his book “Who will feed China”, and during his interview in 2008, he pointed out that the contributions of China to the world are family planning and freshwater fishery; freshwater fishery is popular in China, it is an efficient method in reducing grain consumption for animal protein and a most efficient technology.

In recent years, FAO has been committed to promoting the development of inland fisheries and aquaculture in developing countries, and to solve the food supply and poverty issues; meanwhile, with the support of FAO, Chinese government has also been actively promoting South-South Cooperation in fishery and common development. As one of the four national professional fisheries research institutes in China, FFRC as has long been engaged in helping other developing countries with their aquaculture development, and achieved positive results. Currently, Chinese government is advocating economic cooperation under the framework of “One belt one road” (OBOR), and there is a long cooperation history between China and OBOR countries. In recent years, China has built up two fishery demonstration Centres respectively in Uganda and South Africa, sent experts to many African countries for technical support, and conducted various seminars and technical training programs, making important contribution to the fishery development in Asian, African and Latin American areas, as well as the improvement of their living standard and animal protein supply.

To further promote fishery cooperation and exchange under SSC framework, MOA of China, CAFS, among other departments, are ready to continue to provide support for SSC and common development. We are willing to deepen cooperation, share experience and exchange ideas with other developing countries in healthy aquaculture technology, aquaculture facilities and equipment, find seed selection and breeding, pollution prevention, disease prevention and control, etc., also to encourage qualified institutes and enterprises to set up overseas research Centres and aquaculture bases to promote joint R&D and realize common improvement and development. Through closer cooperation, let’s work harder together to push forward inland fisheries and aquaculture development in all developing countries.

At last, wish the workshop a great success, and wish all of you a good health and happy stay here.

Thank you.

**OPENING REMARKS OF PROF. ZHANG XIANLIANG, PRESIDENT, CHINESE  
ACADEMY OF FISHERY SCIENCES**

*Dear Friends from FAO and all the World, Distinguished Leaders, Experts, Ladies and Gentlemen,*

With the support and guidance of MOA and FAO, China-FAO International High-level Consultative Expert Workshop on Sustainable Development of Aquaculture and Inland Fisheries commences today in the beautiful city Wuxi, where FFRC of CAFS is located. On behalf of CAFS, I would like to extend my warm welcome to all the guests and friends from afar, to express my sincere gratitude to MOA and FAO for their long-term support to CAFS.

China is a big country for fisheries, with an advanced development level in fishery especially in aquaculture. Since the reform and opening up, China's aquaculture industry has gained rapid development and remarkable achievements, with the aquaculture production accounting for over 70 percent of total domestic fishery production and of the world's total aquaculture production. A fishery development mode which is dominated by aquaculture has been forged and crucial contributions have been made to high-quality animal protein supply, farmers' income, food security and food safety. The achievement of China's aquaculture industry owns much to the leading and supporting from scientific and technological progresses. At present, the contribution rate of fishery technological progress exceeds 55 percent, becoming the most dynamic driving factor in modern fisheries construction.

As a national aquaculture research institution, CAFS has 14 units including 9 research institutes (Centres), 4 proliferation experiment stations and the headquarters, and it has jointly set up 5 research institutes with local governments. With over 2900 S&T staff members, CAFS has 3 academicians of Chinese Academy of Engineering, 28 experts with nationally or ministerial outstanding contributions, 25 experts enjoying special government allowances and 32 CAFS chief scientists. Since the establishment, with the concerted efforts, we have made more than 50 percent of the total national and provincial awards in China's fishery sector with only about 20 percent of the country's fishery S&T personnel, and has gained a large number of achievements which have profoundly promoted industrial development and become the important support for fishery technology innovation, modern fishery construction and rural development. Meanwhile, we adhere to opening-up and continuously expand the breadth and depth of international cooperation; currently, CAFS keeps close cooperative relations with more than 70 countries and international organizations. At the same time to learning from developed countries for their advanced fishery technology, we also actively spread China's advanced aquaculture technology and experience to other developing countries, and so far, has trained more than 2,000 senior fishery talents from over 100 countries and regions.

For a long time, FAO has paid special attention and recognition to China's aquaculture and inland fisheries development, and provided great support for international training programs of CAFS. In 2014, FFRC of CAFS was authorized as the "FAO Reference Centre for Aquaculture and Inland Fisheries Research and Training", which is not only the recognition on the foreign-aid trainings of CAFS during the past over 30 years, but also lays a foundation for more efficiently carrying out of international trainings under SSC framework. In the coming days, CAFS will also sign a MOU with FAO to further strengthen the strategic partnership in the field of fisheries.

Last year, in the speech of Chinese Premier Li Keqiang in FAO headquarters, he expressed that eliminating hunger and poverty is a huge challenge and also a common responsibility for the whole world; China is willing to share agriculture techniques, facilities and development modes with all countries, especially other developing countries, and help them in hunger elimination and poverty alleviation. Aquaculture mode in China has been proven to be the most efficient mode of animal protein production. Under the framework of SSC, China is willing to strengthen the exchange and

cooperation with developing countries, share aquaculture techniques and experiences, and jointly to make contributions to world food security.

Here on this high-level meeting, we have senior experts, policy makers, and representatives from different countries who values aquaculture much. I believe through this seminar, you will have a better understanding on China's aquaculture, challenges in aquaculture development, needs and constraints of inland fisheries and aquaculture development in developing countries, as well as propose plans for future cooperation, indicate the direction and provide support for the sustainable development of global aquaculture and inland fisheries.

Finally, wish the workshop a complete success; wish you a pleasant stay and good health in China.

Thank you.

**OPENING REMARKS OF MR AUGUSTO USSUMANE SÓ MSC, PROMOTOR PITCHÉ  
AQUACULTURE PROJECT AND FORMER MINISTER OF ECONOMY AND FINANCE,  
GUINEA-BISSAU**

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**Ji Wenyuan**

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**Li Shumin**

DDG OF Bureau of Fisheries

**Zhang Xianliang**

President of CAFS  
Chinese Academy of Fishery Sciences

**Nathanael Hishamunda**

Senior Aquaculture Officer  
FAO, Rome

*Dear Chair, Distinguished Delegates, Ladies and Gentlemen.*

Good Morning,

It is a big honour for us to make opening remarks on this FAO International High-Level Consultative Expert Workshop (HLCEW) on Sustainable Development of Aquaculture and Inland Fisheries under the Framework of the FAO-China South-South Cooperation (SSC) Program which is taking place here in the City of Wuxi from today to June 5, 2015.

We would like to express our sincere appreciation and gratefulness to the Government of People Republic of China, the Ministry of Agriculture, the Freshwater Fisheries Research Centre (FFRC), the Wuxi City and FAO, on their cooperation and making this workshop happened.

We are strongly confident that it will play a leading role in the FAO-China South-South Cooperation Program and it will open more opportunities for developing countries.

We are all well aware that China had established a long-standing friendship with the developing countries in terms of the South-South Cooperation, which is a vital way for developing countries to seek common development and prosperity by to helping improving the productivity of farmers and fishermen in developing countries. China has always been an active advocator and promoter of South-South Cooperation.

One of value of the South-South Cooperation is that it provides access to the know-how generated in the South, and is therefore of particular relevance to the specific development needs and potential of the South.

We are also very well aware about several advantages that People's Republic of China now the world's largest national economy, offers namely:

- The Chinese comprehensive fisheries research institutes and training Centres namely the Freshwater Fishery Research Centre (FFRC)/Wuxi have much to offer to other developing countries;
- China repeatedly demonstrated its commitment to helping other developing countries to improve their food security;
- Reaching out quickly to a large numbers of people at a relatively low cost with appropriate technology.

China have been financing and deploying to the developing world, thousands of experts and scientists to work alongside local institutions and extension workers to support farmers and their organizations and effectively transfer appropriate technologies or adapt home-made development solutions.

Thank a lot for your attention.

Xie xie

**MAPPING EXERCISE – IDENTIFYING THE CAPACITY DEVELOPMENT NEEDS AND MAPPING THOSE AGAINST THE PROVIDERS WITHIN CHINA UNDER CAFS**

*Working Group 1: Africa, Latin America, Caribbean and China*

<b>PRIORITY ISSUES IN AQUACULTURE</b>	<b>SOLUTION</b>	<b>ACTIVITIES</b>
A. Production 1. Primary Inputs	Accessibility to quality seed and feed	1.1 Establish fish feed manufacturing plants 1.2 Construction seed hatcheries in fresh and marine water 1.3 Training in formulation, making quality feed and feed management
2. Species	Good quality Broodstocks	2.1 Identify broodstock species in aquaculture 2.2 Improve of diversification species 2.3 Organize Training in broodstock management 2.4 Infrastructure for broodstock management
3. Aquaculture Engineering	3.1. Improvement aquaculture production system	3.1.1. Promote technology transfer trough technical assistance, (cages, ponds, tanks, pen construction and management etc.)
4. Health management	4.1. Quality products	4.1.1. Construction of Lab for water Analysis with research Centre
5. IFF (Integrated Fish Farming (IFF)	5.1. Improve integration aquaculture system	5.1.1. Training in water management and treatment Support and promote fish farms integrate 5.1.2. Integration of intensive method (high density management, aeration, fertilization...)
6. Water management	6.1. water quality	6.1.1. Technical assistance and equipment to research Centres
7. Intensification of production system	7.1. Improve aquaculture production	7.1.1. Technical assistance in management of high density, aeration ponds and tanks, promote RSA, and AMIS
B. R & D	Efficient R-D and sustainable	<ul style="list-style-type: none"> <li>• Identify research and development needs in each country</li> <li>• Establish a cooperation programme on regional level on capacity building</li> <li>• Construction and strengthen research Centres, institutes, and Universities in aquaculture</li> <li>• Supply in equipment for research Centres</li> <li>• Exchange scientist and practical experience</li> <li>• Finance Research program in Genetic improvement, feed quality, water quality, diversification species</li> <li>• Training for research centres</li> </ul>

PRIORITY ISSUES IN AQUACULTURE	SOLUTION	ACTIVITIES
C. Funding and Capital	Financial resources mobilization	<ul style="list-style-type: none"> <li>• Promote private joint venture between Chinese investors and local investors</li> <li>• Create aquaculture line of credit for Chinese to invest in developing countries.</li> </ul>
D. Capacity building	<ul style="list-style-type: none"> <li>• Management of the aquaculture sector (capacity of government agencies, regulations and policy, programme of plan, organization)</li> <li>• Training for farmers</li> <li>• Promote aquaculture as a business</li> <li>• Capacitate inland fisheries resource</li> </ul>	<ul style="list-style-type: none"> <li>• Technical assistance with china experts</li> <li>• Training in china and host country</li> <li>• Integration of youth and women in aquaculture activities</li> <li>• Train stakeholders to conduct aquaculture as a sustainable business</li> <li>• Train stakeholders in culture based fisheries in lakes and rivers</li> <li>• Training in assessment and exploitation of inland fisheries resources</li> </ul>
E. Information	<ul style="list-style-type: none"> <li>• Master statistical data in aquaculture</li> </ul>	<ul style="list-style-type: none"> <li>• Improvement of data collection system</li> <li>• Create data base and train trainers</li> <li>• Sharing information through network and website</li> </ul>
F. Market	<ul style="list-style-type: none"> <li>• Commercialization of aquaculture production</li> </ul>	<ul style="list-style-type: none"> <li>• Establish marketing and price information systems</li> <li>• Assist in aquaculture certification</li> </ul>
G. Policy, Legal and Regulatory Framework	<ul style="list-style-type: none"> <li>• Formulation and development of PLRF</li> </ul>	<ul style="list-style-type: none"> <li>• China to assist in formulation of aquaculture policy and legal instruments</li> </ul>

***Working Group 2: Southeast Asia, Central Asia and the Pacific***

Five top aquaculture needs:

1. Aquaculture governance and environmental responsibility
2. Brood stock management and access to improved genetic varieties of fish
3. Affordable and cost-effective fish feeds
4. Aquaculture education, training, and research-capacity
5. Promotion of aquaculture as a business, attracting investment, and ensuring participation by women and youth



**PROGRAMME PROPOSALS ON AQUACULTURE AND CULTURE BASED FISHERIES IN AFRICA, LATIN AMERICA AND THE CARIBBEAN**

<b>PROGRAMME TITLE 1</b>	<b>ENHANCING FOOD AND NUTRITION SECURITY THROUGH CAPACITY BUILDING IN TILAPIA AND CATFISH CULTURE</b>
<b>Recipient Countries</b>	<p><b>Africa:</b></p> <ul style="list-style-type: none"> <li>• Namibia, Malawi, Botswana, Lesotho, Swaziland (SADC),</li> <li>• Senegal, Guinea Bissau, Guinea, (ECOWAS)</li> </ul> <p><b>Latin America and Caribbean:</b></p> <ul style="list-style-type: none"> <li>• Honduras, México, Jamaica, Cuba, Haití (Central América and Caribbean)</li> </ul> <p><b>Pacific:</b></p> <ul style="list-style-type: none"> <li>• Papua New Guinea, Fiji, Vanuatu, Samoa, Solomon Islands</li> </ul>
<b>Duration</b>	5 years
<b>FAO Strategic Objective</b>	<b>Skip for now</b>
<b>Rationale (Problem to address)</b>	<p>Food and nutrition insecurity and extreme poverty are major issues for many nations in Africa, Latin America, the Caribbean and the Pacific ocean. Aquaculture of tilapia spp and catfish can make major contributions, if there are targeted interventions to address the following constraints to aquaculture development in these countries:</p> <ul style="list-style-type: none"> <li>• Lack of reliable and affordable production inputs (seed, feed, and commercialization of aquaculture products)</li> <li>• Lack of expertise</li> <li>• Lack of aquaculture facilities and infrastructure</li> </ul>
<b>Goal</b>	Increased contributions from tilapia and/or catfish aquaculture toward food security, nutrition, and livelihoods in the project countries
<b>Activities</b>	<ul style="list-style-type: none"> <li>• Training and education including non-formal education (field schools, demonstration farms, and work experience attachments) for aquaculture industry practitioners and extension staff in seed and feed production for tilapia and/or catfish</li> <li>• Selection and in-country demonstration of appropriate technologies for seed and feed</li> <li>• Analysis of markets and distribution channels for aquaculture products, and development of recommendations to strengthen value chains that can deliver more equitable benefits to farmers (such analyses to be disaggregated by gender and age)</li> <li>• Establish and/or upgrade key facilities and infrastructure needed to support seed and feed production, and in-country training</li> </ul>
<b>Expected Outcomes</b>	<ul style="list-style-type: none"> <li>• Increase of the national production in tilapia and/or catfish</li> <li>• Improvement of aquaculture technology and capacity</li> <li>• Food security strengthened</li> <li>• Increased livelihoods and empowerment of marginalized communities, including for women and youth</li> </ul>
<b>Expected Long-term Impact</b>	Food security and economic development in rural areas and marginalized peri-urban communities has improved.
<b>Estimated Budget</b>	

<b>PROGRAMME TITLE 2</b>	<b>ENHANCE FOOD AND NUTRITION SECURITY IN WEST AFRICA THROUGH AQUACULTURE AND RICE FARMING WITHIN THE SOUTH-SOUTH COOPERATION PROGRAMME</b>
<b>Recipient Countries</b>	Guinea-Bissau, Guinea and Senegal (ECOWAS Region)
<b>Duration</b>	5 years
<b>FAO Strategic Objective and/or Regional Initiative</b>	
<b>Rationale (Problem to address)</b>	<p>Food and nutrition insecurity, and extreme poverty, are major development issues in West African nations such as Guinea-Bissau, the Republic of Guinea and Senegal, which operate at individual, household and national levels. Yet these countries are endowed with abundant natural resources including land and water, which are conducive to aquaculture and rice development. Aquaculture and rice have been identified in various national planning, policy and priority-setting documents (for example, Poverty Reduction Strategies PRS and Country Profile Frameworks CPF) as vehicles for achieving national food and nutrition security, reducing poverty and enhancing rural development. These sectors are relatively new so international assistance is required to increase national capacity to adopt these solutions, in particular to overcome constraints like:</p> <ul style="list-style-type: none"> <li>• The shortage of basic infrastructure for quality aquaculture and rice seed production, and for quality aqua-feed production;</li> <li>• limited access to investment capital;</li> <li>• limited know-how in conducting aquaculture of various species and rice farming in an efficient and sustainable manner, and</li> <li>• absence of enabling policies in conducting aquaculture as a business, and creating small-and medium scale aquaculture and rice enterprises along these industries' value-chains.</li> </ul> <p>This project will contribute toward addressing the above development constraints in the aquaculture and rice industries.</p>
<b>Goal</b>	To contribute to food and nutrition security, poverty reduction and rural development in the beneficiary countries.
<b>Activities</b>	<ul style="list-style-type: none"> <li>• Training and education including non-formal education (field schools, demonstration farms, and work experience attachments) for aquaculture and rice industry practitioners and extension staff in seed and feed production, and grow-out</li> <li>• Selection and in-country demonstration of appropriate technologies for fish and rice seed and feed</li> <li>• Establish and/or upgrade key facilities and infrastructure needed in the private sector to support seed and feed production for aquaculture and rice farming</li> <li>• Exploration of options to improve access to credit and investment capital for aquaculture and rice farming, including the mechanism of joint-ventures between local and foreign investors</li> </ul>
<b>Expected Outcomes</b>	<ol style="list-style-type: none"> <li>1. Adequate and operational bases for accelerating sustainable growth of aquaculture and rice farming in recipient countries.</li> <li>2. Quality aqua-feed and seed, and rice seed and other inputs, are locally produced, available and accessible to farmers.</li> <li>3. Credit line for aquaculture development in Africa, established and operational;</li> <li>4. First aquaculture/rice business partnerships negotiated and established between foreign and domestic investors in recipient countries;</li> <li>5. Significantly increased aquaculture and rice production in recipient countries.</li> </ol>
<b>Expected Long-term Impact</b>	A significantly enhanced contribution of aquaculture and rice farming to food and nutrition security, youth and women's employment, and rural development.

<b>Expected Outputs</b>	1. At least two privately operated hatcheries produce good-quality fingerlings in each recipient country
	2. One to two privately operated fish feed mills produce good-quality aqua-feed in each recipient country
	3. At least two government or privately operated rice seed multiplication Centres produce good-quality rice seed in each recipient country
	4. At least 50 farmers are locally trained in good aquaculture practices including those in hatchery management in each recipient country
	5. At least 50 farmers are locally trained in good rice farming practices in each recipient country
	6. At least 10 trainers are locally trained in good aquaculture practices including those in hatchery management in each recipient country
	7. At least 10 trainers are locally trained in good rice farming practices in each recipient country
	8. At least 10 trainers in aquaculture and 10 in rice farming, 25 fish farmers and 25 rice farmers, and 5 policy makers receive a study tour in China
	9. At least one partnership between foreign and domestic investors in each of the recipient countries is operational, as appropriate.

<b>PROGRAMME TITLE 3</b>	<b>IMPROVE GOVERNANCE (POLICY, LEGAL AND REGULATORY FRAMEWORK) TO ENSURE SUSTAINABLE AQUACULTURE DEVELOPMENT FOR SOME COUNTRIES IN AFRICA, LATIN AMERICA AND CARIBBEAN.</b>
<b>Recipient Countries</b>	<b>Africa:</b> <ul style="list-style-type: none"> <li>• Lesotho, Botswana, Swaziland, Guinea Bissau, Guinea Conakry, (ECOWAS)</li> </ul> <b>Latin America and Caribbean:</b> <ul style="list-style-type: none"> <li>• Honduras, Haití (Central America and Caribbean)</li> </ul>
<b>Duration</b>	5 years
<b>FAO Strategic Objective</b>	<b>Skip for now</b>
<b>Rationale (Problem to address)</b>	Development of aquaculture is based on well-founded governance able to create a conducive environment for private sector involvement and investment in aquaculture for provision of nutritious fish products and economic development. However in most counties a Lack of a policy and legal framework for sustainable aquaculture has hindered its development.
<b>Goal</b>	Sustainable aquaculture development of the region
<b>Expected Outcomes</b>	<ul style="list-style-type: none"> <li>• Policies and acts regulations developed.</li> <li>• Implementation of policy and legal framework.</li> <li>• Review of existent policies.</li> </ul>
<b>Expected Long-term Impact</b>	<ul style="list-style-type: none"> <li>• Appropriate Governance and Regulatory framework in place.</li> <li>• Aquaculture Development in a sustainable manner.</li> </ul>
<b>Estimated Budget</b>	

<b>PROGRAMME TITLE 4</b>	<b>IMPROVEMENT OF AQUACULTURE PRODUCTION THROUGH ADAPTIVE RESEARCH AND DEVELOPMENT PROGRAMMES IN AFRICA, LATIN AMERICA AND THE CARIBBEAN</b>
<b>Recipient Countries</b>	<p><b>Africa:</b></p> <ul style="list-style-type: none"> <li>• Namibia Lesotho, Malawi, Swaziland (SADC),</li> <li>• Senegal, Guinea Bissau, Guinea (ECOWAS)</li> </ul> <p><b>Latin America and Caribbean:</b></p> <ul style="list-style-type: none"> <li>• Honduras, Mexico, Costa Rica, Jamaica, Cuba, Haiti (Central America and Caribbean)</li> </ul> <p><b>Central Asia</b></p> <ul style="list-style-type: none"> <li>• Kazakhstan, Uzbekistan, [all five Central Asian countries]</li> </ul>
<b>Duration</b>	5 years
<b>FAO Strategic Objective</b>	<b>Skip for now</b>
<b>Rationale (Problem to address)</b>	Applied and adaptive research is necessary for aquaculture development in the above referenced countries. In order to improve and increase aquaculture production, there is a need to establish and strengthen research institutions in the host countries and impart relevant skills through international collaboration. The research institutional capacity in the recipient countries is presently insufficient to achieve ( <i>inter alia</i> ) the necessary diversification and genetic improvement of aquaculture species, technology transfer, and production of quality feed and seed.
<b>Goal</b>	Aquaculture development for the region is supported by applied research to become more sustainable and profitable.
<b>Activities</b>	<ul style="list-style-type: none"> <li>• Post-graduate education and research opportunities to be provided both in-country and in relevant foreign countries</li> <li>• Collaborative research topics be developed and funded for implementation in-country by joint teams of researchers with overseas partner institutions</li> <li>• Collaborative research projects be planned as a means to improve both the human capacity and level of equipment of in-country research institutions via project budgets</li> <li>• Participatory research in on-farm trials with private farmers be considered as a strategy to achieve realistic and commercially relevant research outcomes, gain increased ownership and adoption of research outcomes by industry practitioners, and help to over-come deficiencies in in-country research infrastructure</li> </ul>
<b>Expected Outcomes</b>	<ul style="list-style-type: none"> <li>• Development of best practices in aquaculture.</li> <li>• Creation of skilled aquaculture sector (sector stakeholders) and specialized researchers in-country.</li> <li>• Developed institutional setup through well-equipped research institutions.</li> <li>• Increase in development and adoption of locally relevant research outcomes</li> <li>• Development of genetically improved strains for local conditions.</li> <li>• Aquaculture species diversification.</li> </ul>
<b>Expected Long-term Impact</b>	Aquaculture knowledge and research capacity increased in the recipient countries.
<b>Estimated Budget</b>	

<b>PROGRAMME TITLE 5</b>	<b>EMPOWERING YOUTH AND WOMEN IN WEST AFRICA, LATIN AMERICA AND CARIBBEAN THROUGH AQUACULTURE WITHIN THE SOUTH-SOUTH COOPERATION PROGRAMME</b>
<b>Recipient Countries</b>	<p><b>Africa</b></p> <ul style="list-style-type: none"> <li>• Guinea-Bissau, Guinea, Senegal (ECOWAS Region)</li> </ul> <p><b>Latin America and Caribbean:</b></p> <ul style="list-style-type: none"> <li>• Honduras, Mexico, Costa Rica, Jamaica, Cuba, Haiti (Central America and Caribbean)</li> <li>• Asia, Central Asia, Oceania</li> </ul>
<b>Duration</b>	5 Years
<b>FAO Strategic Objective and/or Regional Initiative</b>	
<b>Rationale (Problem to address)</b>	<p>In addition to food and nutrition insecurity, an overriding problem in many African countries, Latin and Central America is poverty and high unemployment rates. The increasing trend of youth unemployment in West Africa and the threat it poses to overall socio-economic growth, peace and stability has now gained a growing prominence on the developmental agenda.</p> <p>Youth constitutes a large part of the population of West African states. Close to 42.3 percent of the estimated 2011 population of 308 million inhabitants of West Africa are below the age of 15, and approximately 65.5 percent of the total population lives in rural areas where agriculture including aquaculture is the main economic activity.</p> <p>Unemployment mostly among the youth is one of the key challenges facing these countries, where, on the average, 22% of the youth is unemployed with unemployment rate reaching 90% in some countries. Women's unemployment is even higher, sometimes reaching 98% in some nations.</p> <p>The increasing trend of youth unemployment and the threat it poses to overall socio-economic growth, peace and stability has in recent years gained a growing prominence on the developmental agenda. As one example, the 28<sup>th</sup> FAO Africa Regional Conference (ARC) held at Tunis in 2014 had as its main theme "<i>Aquaculture and Youth Employment</i>". This project aims at contributing to implementation of high-level policy decisions about the acute problems of youth and women's poverty and unemployment.</p>
<b>Goal</b>	To contribute to empowering the youth and women in the beneficiary countries by reducing their rates of poverty and unemployment through creation of aquaculture farming small and medium-scale enterprises.
<b>Activities</b>	<ul style="list-style-type: none"> <li>• Conduct a review of the current status and priority issues related to age and gender in the aquaculture and rural development sectors of the recipient countries</li> <li>• Incorporate age and gender disaggregation into the collection, storage and analysis of future statistics in aquaculture and rural development</li> <li>• Devise programs that aim to actively increase, and reduce any barriers to, participation in aquaculture and rural development through explicit consideration of any differential needs that may arise on the basis of age or gender</li> </ul>
<b>Expected Outcomes</b>	<ul style="list-style-type: none"> <li>• Women and youth integration in product chain activity.</li> <li>• Diversification of primary sector.</li> <li>• Eradicate of food insecurity.</li> <li>• Generation of jobs.</li> <li>• Reduce of youth migration.</li> </ul>
<b>Expected Long-term Impact</b>	Improved life quality of the Region.

**INTERNATIONAL HIGH-LEVEL CONSULTATIVE EXPERT WORKSHOP ON  
SUSTAINABLE DEVELOPMENT OF AQUACULTURE AND INLAND FISHERIES**

**OUTLINES OF PROGRAMME PROPOSALS FOR ASIA AND OCEANIA**

<b>PROGRAMME TITLE</b>	<b>REGIONAL TRAINING PROGRAMME ON AQUACULTURE GOVERNANCE FOR AFRICA, ASIA-PACIFIC, CENTRAL ASIA, LATIN AMERICA &amp; CARIBBEAN</b>
<b>Recipient Countries</b>	Africa, Asia-Pacific, Latin America & Caribbean
<b>Implementation agencies</b>	NACA, FAO, CAFS/FFRC
<b>Duration</b>	4 Years, 2 training courses/year, 3–4 weeks/course
<b>FAO Strategic Objective</b>	This programme will meet all five FAO strategic objectives: <ol style="list-style-type: none"> <li>1. help eliminate hunger, food insecurity and malnutrition</li> <li>2. make aquaculture more productive and sustainable</li> <li>3. reduce poverty</li> <li>4. enable inclusive and efficient food systems by mean of aquaculture development and management</li> <li>5. increase the resilience of livelihoods to threats and crises due to impacts of climate changes and natural disasters, etc.</li> </ol>
<b>Rationale (Problem to address)</b>	As a new and rapid development, many countries have no appropriate national aquaculture development policies/strategies. There is lack of effective regulatory framework for good governance of aquaculture sectors in many developing countries for safeguarding the sustainable aquaculture development.
<b>Goal</b>	Promote sustainable development of aquaculture sectors in developing countries contributing to food security, nutrition, livelihood opportunities and economic development.
<b>Types of activities</b>	Regional Workshops and regional training courses which cover: <ul style="list-style-type: none"> <li>• National aquaculture development policy and supporting strategies</li> <li>• Legal frameworks and institutional arrangements</li> <li>• Good aquaculture management practices</li> <li>• Ecosystem approach to aquaculture</li> <li>• Food safety</li> <li>• Biosecurity</li> </ul>
<b>Expected Outcomes</b>	<ul style="list-style-type: none"> <li>• Effective sharing of aquaculture development policies and strategies between China and developing countries</li> <li>• Strengthened capacity of developing countries in developing appropriate national policy and strategies for sustainable development of aquaculture industry</li> <li>• Strengthened capacity for informed planning of aquaculture sector in developing countries</li> <li>• Strengthened capacity for good governance of aquaculture sector</li> </ul>
<b>Expected Long-term Impact</b>	<ul style="list-style-type: none"> <li>• Establishment of a conducive investment environment through appropriate national aquaculture development policy</li> <li>• Informed planning of aquaculture sector</li> <li>• Strengthened governance of aquaculture sector for sustainable development</li> </ul>
<b>Estimated Budget</b>	

<b>PROGRAMME TITLE</b>	<b>STRENGTHEN AQUACULTURE STATISTICS AND DATA MANAGEMENT</b>
<b>Recipient Countries</b>	All developing countries
<b>Implementing agencies</b>	CAFS/FFRC, FAO/SPC
<b>Duration</b>	5 years
<b>FAO Strategic Objective</b>	<b>Skip for now</b>
<b>Rationale (Problem to address)</b>	As a new developed industry, aquaculture statistical data collection, analysis and utilization is generally weak, which is a significant constraint for informed planning and management of the sector
<b>Goal</b>	Establishment of effective mechanisms and human capacity for good aquaculture data collection, analysis and utilization for informed planning and effective management of the sector, and for policy development and national financial planning purposes
<b>Types of activities</b>	<ul style="list-style-type: none"> <li>• Regional workshop for sharing good aquaculture data collection systems</li> <li>• Regional training workshop on harmonized methodology and standards for aquaculture data collection, analysis and dissemination</li> <li>• Selection and provision of appropriate technology and devices for aquaculture statistics collection and storage</li> <li>• Statistical census of aquaculture sector in selected countries</li> </ul>
<b>Expected Outcomes</b>	<ul style="list-style-type: none"> <li>• National human capacity for aquaculture data collection and analysis is significantly strengthened</li> <li>• National systems for good aquaculture data collection, analysis and dissemination are effectively established</li> </ul>
<b>Expected Long-term Impact</b>	Appropriate aquaculture policy development, informed planning and effective sectoral management through sound aquaculture data collection, analysis and dissemination
<b>Estimated Budget</b>	

<b>PROGRAMME TITLE</b>	<b>PROMOTE CAGE CULTURE DEVELOPMENT AND GOOD MANAGEMENT PRACTICES</b>
<b>Recipient Countries</b>	Asia, Central Asia, and Pacific
<b>Implementing agencies</b>	CAFS/FFRC, FAO
<b>Duration</b>	3 years (2015–2018)
<b>FAO Strategic Objective</b>	<b>Skip for now</b>
<b>Rationale (Problem to address)</b>	Many countries have under-utilized open water resources that are suitable for cage culture, which can effectively promote fish production from these water bodies. Many countries have not established up-scaled cage culture production with good management practices
<b>Goal</b>	Increase fish production from open water bodies in a sustainable manner in the countries with suitable resources
<b>Types of activities</b>	<ul style="list-style-type: none"> <li>• Regional training courses on cage culture technology and good management practices, including estimation of environmental carrying capacity limits</li> <li>• Demonstrations of cage culture with good management practices and cage designs appropriate for local conditions</li> </ul>
<b>Expected Outcomes</b>	<ul style="list-style-type: none"> <li>• Well-developed human capacity for developing cage culture</li> <li>• Successful transfer and adoption of appropriate cage culture technology and management practices</li> <li>• Well established and sustainable cage culture at a commercial scale</li> </ul>
<b>Expected Long-term Impact</b>	<ul style="list-style-type: none"> <li>• Significant increase in production of fish from open water bodies</li> <li>• Significant contributions to livelihood opportunities and poverty reduction</li> </ul>
<b>Estimated Budget</b>	

<b>PROGRAMME TITLE</b>	<b>PROMOTE CULTURE BASED FISHERIES AND STOCK ENHANCEMENT PRACTICES</b>
<b>Recipient Countries</b>	Asia, Central Asia and Pacific
<b>Implementing agencies</b>	CAFS/FFRC, FAO
<b>Duration</b>	3 years (2015–2018)
<b>FAO Strategic Objective</b>	<b>Skip for now</b>
<b>Rationale (Problem to address)</b>	Culture based fisheries and fish stock enhancement are effective approaches to increase fish production in open water bodies sustainably. Many countries have extensive open water resources for culture based fisheries or fish stock enhancement. But few countries have effective management systems and supporting technologies for good culture based fisheries and fish stock enhancement
<b>Goal</b>	Increase fish production from open water bodies in a sustainable manner.
<b>Types of activities</b>	<ul style="list-style-type: none"> <li>• Regional training workshops for sharing successful management models and experiences on culture based fisheries and fish stock enhancement</li> <li>• Demonstration and evaluation of technologies supporting effective culture based fisheries and fish stock enhancement</li> </ul>
<b>Expected Outcomes</b>	<ul style="list-style-type: none"> <li>• Well establish human capacity for culture based fisheries and fish stock enhancement</li> <li>• Successful culture based fisheries and fish stock enhancement well demonstrated</li> <li>• Culture based fisheries and fish stock enhancement are implemented with good practices</li> </ul>
<b>Expected Long-term Impact</b>	<ul style="list-style-type: none"> <li>• Significantly improved fish production from open water bodies</li> <li>• Improved supply of fish to local communities and markets</li> <li>• Improved livelihoods for local communities</li> </ul>
<b>Estimated Budget</b>	

<b>PROGRAMME TITLE</b>	<b>PROMOTE QUALITY FARM MADE FISH FEEDS AND GOOD FEEDING PRACTICES</b>
<b>Recipient Countries</b>	Asia, Central Asia and Pacific
<b>Implementing agencies</b>	CAFS/FFRC, FAO
<b>Duration</b>	3 years (2015–2018)
<b>FAO Strategic Objective</b>	<b>Skip for now</b>
<b>Rationale (Problem to address)</b>	Feed comprises a large proportion of aquaculture production costs. Commercial feeds are often expensive and not locally available in many countries. Quality farm made feed and related food feeding practices can significantly reduce production costs, while increasing production efficiency. Many countries lack technologies for producing quality farm made feed and related good management practices
<b>Goal</b>	Improve aquaculture production efficiency via more affordable feed costs and sound environmental benefits.
<b>Types of activities</b>	<ul style="list-style-type: none"> <li>• Conduct regional training courses on technology for producing quality farm made feed and good farm feeding practices</li> <li>• Demonstrate effective production of aquaculture with quality farm made feed and good feeding management, and demonstrate mechanically reliable cost-effective equipment for farm made feed production</li> </ul>
<b>Expected Outcomes</b>	<ul style="list-style-type: none"> <li>• Increased production and use of quality farm made feed</li> <li>• Improved feeding practices</li> <li>• Significantly reduced unit feed cost in the production</li> </ul>
<b>Expected Long-term Impact</b>	<ul style="list-style-type: none"> <li>• Increased unit fish production from aquaculture</li> <li>• Improved economic return in aquaculture</li> <li>• Reduced environmental impact from aquaculture effluent discharge</li> </ul>
<b>Estimated Budget</b>	



<b>PROGRAMME TITLE</b>	<b>PROMOTE INTEGRATED AGRICULTURE-AQUACULTURE, MULTI-TROPHIC FARMING (IMTF), AND AQUAPONICS SYSTEMS</b>
<b>Recipient Countries</b>	Asia, Central Asia and Pacific
<b>Implementing agencies</b>	CAFS/FFRC, FAO
<b>Duration</b>	3 years (2015–2018)
<b>FAO Strategic Objective</b>	<b>Skip for now</b>
<b>Rationale (Problem to address)</b>	Integrated agriculture-aquaculture, multi-trophic farming (IMTF) systems, and aquaponics systems, can significantly reduce the environmental impact of aquaculture and improve the resource utilization efficiency and economic efficiency through reutilization of wastes. But few countries have good management models and related technologies for Integrated agriculture-aquaculture, multi-trophic farming (IMTF) systems, and aquaponics systems
<b>Goal</b>	To improve the resources utilization efficiency, reduce environmental impacts of intensive aquaculture, and improve economic efficiency of aquaculture production, through effective Integrated agriculture-aquaculture systems, multi-trophic farming (IMTF) systems, and aquaponics systems
<b>Types of activities</b>	<ul style="list-style-type: none"> <li>• Regional training workshops on successful technologies and effective management models for practicing Integrated agriculture-aquaculture systems, multi-trophic farming (IMTF) systems, and aquaponics systems, under local conditions</li> <li>• In-country demonstration of good Integrated agriculture-aquaculture, multi-trophic farming (IMTF), and aquaponics systems</li> <li>• Economic evaluations under local conditions of Integrated agriculture-aquaculture, multi-trophic farming (IMTF), and aquaponics systems</li> </ul>
<b>Expected Outcomes</b>	<ul style="list-style-type: none"> <li>• Successful sharing of technologies and management models for Integrated agriculture-aquaculture, multi-trophic farming (IMTF), and aquaponics systems</li> <li>• Successful demonstration of Integrated agriculture-aquaculture, multi-trophic farming (IMTF), and aquaponics systems</li> <li>• Economic information as a basis for sound investments in Integrated agriculture-aquaculture, multi-trophic farming (IMTF), and aquaponics systems</li> </ul>
<b>Expected Impact</b> <b>Long-term</b>	<ul style="list-style-type: none"> <li>• Improved overall production of the farming system</li> <li>• Improved utilization to natural resources, e.g. water, land and feed/fertilizers in intensive aquaculture;</li> <li>• aquaculture are made more sustainable</li> <li>• Improved economic returns to aquaculture farmers</li> </ul>
<b>Estimated Budget</b>	

<b>PROGRAMME TITLE</b>	<b>IMPROVED GENETIC QUALITY OF AQUACULTURE SEED AND CONSERVATION OF GENETIC RESOURCES BIODIVERSITY</b>
<b>Recipient Countries</b>	Asia, Central Asia and Pacific
<b>Implementing agencies</b>	CAFS/FFRC, FAO/NACA
<b>Duration</b>	3 weeks of training
<b>FAO Strategic Objective</b>	<b>Skip for now</b>
<b>Rationale (Problem to address)</b>	Genetically improved seed can significantly increase the production efficiency and economic returns of aquaculture. Loss of genetic quality can lead to poor growth performance and lower disease resistance. Conservation of genetic biodiversity is vitally important to aquatic biodiversity and availability of genetic materials for genetic improvement in aquaculture. Many countries lack needed technical capacity and material basis for effective genetic improvement work and genetic biodiversity conservation.
<b>Goal</b>	Improve the production efficiency and economic efficiency in aquaculture and protect aquatic genetic biodiversity
<b>Types of activities</b>	<ul style="list-style-type: none"> <li>• Regional training on technologies for aquatic genetic improvement and aquatic genetic biodiversity conservation</li> <li>• Regional training course on good hatchery management practices (including brood stock management)</li> <li>• Sharing genetic resources including genetically improved strains</li> <li>• Support for pilot aquatic genetic improvement programs</li> </ul>
<b>Expected Outcomes</b>	<ul style="list-style-type: none"> <li>• Human capacity developed for aquatic genetic improvement work</li> <li>• Fish hatchery management significantly improved</li> <li>• System for conservation of aquatic genetic biodiversity established</li> </ul>
<b>Expected Long-term Impact</b>	<ul style="list-style-type: none"> <li>• Significantly improved aquaculture seed quality which contributes to improved production efficiency and economic returns in aquaculture</li> <li>• Aquatic genetic biodiversity effectively protected for aquatic biodiversity and sustainable use in aquaculture</li> </ul>
<b>Estimated Budget</b>	

<b>PROGRAMME TITLE</b>	<b>STRENGTHEN AQUATIC ANIMAL HEALTH MANAGEMENT AND BIOSECURITY CONTROL</b>
<b>Recipient Countries</b>	Asia, Central Asia and Pacific
<b>Implementing agencies</b>	CAFS/FFRC, FAO/NACA
<b>Duration</b>	3 years
<b>FAO Strategic Objective</b>	<b>Skip for now</b>
<b>Rationale (Problem to address)</b>	Animal disease is a major threat to successful aquaculture production and farmer's economic performance. Biosecurity control not only affects the health of cultured animals but also the natural population. Many countries lack human capacity and effective regulatory systems for effective aquatic animal health management and biosecurity control.
<b>Goal</b>	Develop required human capacity and establish effective systems for aquatic animal health management, disease surveillance, emergency response and biosecurity control
<b>Types of activities</b>	<ul style="list-style-type: none"> <li>• Regional technical training courses on aquatic animal health management</li> <li>• Support to establish effective biosecurity control, aquatic animal disease surveillance and emergency response systems</li> </ul>
<b>Expected Outcomes</b>	<ul style="list-style-type: none"> <li>• Human capacity for effective aquatic animal health management, disease surveillance and emergency response and biosecurity control are well established</li> <li>• Effective national strategy and system for aquatic animal disease surveillance and emergency response systems established</li> </ul>
<b>Expected Long-term Impact</b>	<ul style="list-style-type: none"> <li>• Significantly reduced losses in aquaculture due to disease problems</li> <li>• Risk of spread of aquatic animal disease among cultured aquatic animals and natural populations are significantly reduced.</li> </ul>
<b>Estimated Budget</b>	

<b>PROGRAMME TITLE</b>	<b>INCREASE THE RESILIENCE OF FISH FARMERS AND AQUACULTURE SECTOR AGAINST CLIMATE CHANGE AND OTHER RISKS</b>
<b>Recipient Countries</b>	Asia, Central Asia and Pacific
<b>Implementing agencies</b>	NACA, FAO, FFRC and partners
<b>Duration</b>	12 Months (July 2015 – May 2016)
<b>FAO Strategic Objective</b>	This programme will meet all five FAO strategic objectives: <ol style="list-style-type: none"> <li>1. help eliminate hunger, food insecurity and malnutrition</li> <li>2. make aquaculture more productive and sustainable</li> <li>3. reduce poverty</li> <li>4. enable inclusive and efficient food systems by mean of aquaculture development and management, and</li> <li>5. increase the resilience of livelihoods to threats and crises due to impacts of climate changes and natural disasters, etc.</li> </ol>
<b>Rationale (Problem to address)</b>	Climate change related impacts have become emerging threats affecting resilience and sustainability of fisheries and aquaculture worldwide. Many countries are not informed by knowledge related to the impact on aquaculture and fisheries and have not developed required strategies and good management practices to mitigate the impacts and contribute of climate changes. There is urgent need to share knowledge and experiences, lessons-learned and adaptive management to build up resilience for mitigation and adaptation of the climate change impacts at the ground level.
<b>Goal</b>	Increase the overall resilience of fish farmers, fishers and the fisheries and aquaculture sector against climate impacts and other related threats through implementing appropriate strategies and adoption of climate smart aquaculture and fisheries practices.
<b>Types of activities</b>	<ul style="list-style-type: none"> <li>• Organize regional consultative workshops on clear identification of immediate impacts of climate changes and related threats to fisheries and aquaculture and developing specific adaptation and mitigation strategies</li> <li>• Conduct regional training courses for sharing successful technologies, experiences on climate smart aquaculture and fisheries practices</li> </ul>
<b>Expected Outcomes</b>	<ul style="list-style-type: none"> <li>• Significantly increased awareness on potential impacts of climate changes and other related threats on aquaculture and fisheries</li> <li>• Strengthened human capacity on climate change adaptation and mitigation in the areas of aquaculture and fisheries</li> <li>• National strategies for climate change adaptation and mitigation in the areas of aquaculture and fisheries developed</li> <li>• Climate smart aquaculture and fisheries practices disseminated and implemented</li> </ul>
<b>Expected Long-term Impact</b>	Climate resilient aquaculture and fisheries that contribute sustainably to food security, nutrition, rural livelihood and economic growth
<b>Estimated Budget</b>	

<b>PROGRAMME TITLE</b>	<b>PROMOTE AQUACULTURE AS A BUSINESS AND FOSTER DEVELOPMENT OF AQUACULTURE VALUE CHAINS</b>
<b>Recipient Countries</b>	Countries in Asia-Pacific, Central Asia, Africa, Latin America and Caribbean
<b>Implementing agencies</b>	CAFS/FFRC, FAO, NACA
<b>Duration</b>	3–5 years
<b>FAO Strategic Objective</b>	<b>Skip for now</b>
<b>Rationale (Problem to address)</b>	Aquaculture has to be developed into a business in order to be sustainable and contribute significantly to rural livelihoods. Small to medium scale aquaculture businesses need to be strongly supported by efficient aquaculture value chain development. Currently, in many countries, aquaculture farmers do not have the awareness of this concept and the management experience to manage fish farming as a business. In many countries, aquaculture business value chains are under-developed and require strengthening to support the sector's development
<b>Goal</b>	To support the commercialization of aquaculture through small-medium business operation by large number of farmers and supported by well-established aquaculture value chains
<b>Types of activities</b>	<ul style="list-style-type: none"> <li>• Regional Workshop on aquaculture value chain development</li> <li>• Regional Training course on aquaculture business management models and practices</li> <li>• Demonstration of successful small-medium aquaculture business operations</li> </ul>
<b>Expected Outcomes</b>	<ul style="list-style-type: none"> <li>• Successful aquaculture value development strategy and approached are effective shared;</li> <li>• Small and medium aquaculture farmers are empowered with knowledge, techniques and experiences to run aquaculture as a business</li> </ul>
<b>Expected Long-term Impact</b>	The aquaculture sector is developed into a major industry that contributes significantly to livelihood opportunities and local and national economies.
<b>Estimated Budget</b>	

GROUP PHOTOGRAPH OF WORKSHOP PARTICIPANTS



**This document represents the final report of the International High-Level Consultative Expert Workshop (HLCEW) on Sustainable Development of Aquaculture and Inland Fisheries, which was held in Wuxi, Jiangsu Province, China, from 1 to 5 June 2015 under the framework of the FAO–China South–South Cooperation (SSC) Programme. The objectives of the workshop were to formulate a five-year agenda of priorities for action to promote sustainable inland fisheries and aquaculture development for food security and rural development in developing countries, and to identify the most urgent needs and challenges in less aquaculture developed countries and propose mechanisms to address them via SSC, especially the FAO–China SSC Programme. The workshop was attended by participants from ten countries (Bangladesh, Cambodia, Guinea-Bissau, Indonesia, Jamaica, Kazakhstan, Mexico, Namibia, Senegal and Uzbekistan); regional partner institution representatives (Network of Aquaculture Centres in Asia and the Pacific, and Secretariat of the Pacific Community); host country (China) institution representatives, and FAO staff. Recommendations were made with reference to the assistance required to facilitate the request and implementation of projects within the SSC framework.**

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