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COMMITTEE ON FISHERIES

SUB-COMMITTEE ON AQUACULTURE

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OPPORTUNITIES FOR ADDRESSING THE CHALLENGES IN MEETING THE RISING GLOBAL DEMAND FOR FOOD FISH FROM AQUACULTURE

Summary

This paper attempts to examine the status of aquaculture production and markets, with a view to identifying the most compelling issues that require attention by the aquaculture sector, in order to provide an enabling environment for the sector to meet projected global demand for aquatic food. This paper seeks advice from the Sub-Committee members for the FAO Secretariat to conduct priority activities as required.

Demand for aquaculture products continues to grow

1. In the 1970s aquaculture accounted for only 6 percent of global food fish[1] destined for human consumption. Aquaculture now accounts for nearly half (47 percent in 2006) of the world's food fish. Considering the current rate of growth in aquaculture production, this increase is expected to reach at least 50 percent before 2010[2].

2. World per capita consumption of fish and fishery products has risen steadily over the past decades from an average of 11.5 kg during the 1970s, 12.5 kg in the 1980s to 14.4 kg in the 1990s. Consumption in the recent years has continued to grow and the preliminary figures for 2006 indicate it reaching 16.7 kg per caput.

[1] Unless stated otherwise in this document the term fish also includes crustaceans and molluscs.
[2] All figures quoted in this document are based on FAO statistical data or data derived through FAO activities.

3. In 2006, the world consumed 110.4 million tonnes of fish, 51.7 million tonnes originating from aquaculture. The earth's population is forecast to reach 8.32 billion in 2030. If capture fisheries production (92 million tonnes in 2006) and the non-food uses of fish (33.3 million tonnes in 2006) remain constant, aquaculture needs to produce 80.5 million tonnes by 2030 in order to maintain the current per capita consumption of 16.7 kg. That is, 25 years from now, aquaculture will need to produce 28.8 million tonnes more per year than current annual production.

4. Assuming a sustained demand for fish (the world is prepared to pay for fish as a desirable food product), the question remains whether the sector can grow fast enough, and sustain the projected demand for food fish, whilst ensuring consumer protection, maintaining environmental integrity and achieving social responsibility.

Aquaculture slows, but continues to grow

5. The growth of aquaculture (in volume) has already begun to slow down. From a yearly average of 11.8 percent in 1985-1995 it has decreased to 7.1 percent during the following decade, and the average rate of growth during 2004-2006 was 6.1 percent in volume and 11 percent in value.

6. Will the current growth rate maintain its course to produce the additional 29 million tonnes of food fish a year needed to maintain the current per capita consumption of fish by the year 2030? The 2004-2006 growth rate of around 6.1 percent a year could very well falter; the sector may encounter numerous constraints in the coming decades. What are such constraints and what will the impact of such be?

Trends in species, consumption and trade

7. World aquaculture production is dominated by species at the lower end of the food chain. Carp and shellfish account for a significant share (>70 percent) of species cultivated in developing countries for human consumption. However, in response to a ready market for these species in both developed and developing countries, the production of species at the higher end of the food chain has, in recent years, been growing rapidly compared to that of the lower end of the food chain.

8. The demand for fish as a healthy and nutritious food commodity is increasing, even in the developing world. As disposable income of the three main populations in the developing world, China, India and Indonesia are steadily growing even as their populations increase.

9. The demand for low value species for national consumption is currently met primarily through national production, however, this may not be the case in the coming decades. Low value fish may be farmed, and shifted for local consumption, in regions and countries where the cost of production is low and production conditions are better,whilst nationally produced high value fish might enter the global market.

10. Globally, fish is an important export commodity. The value of world exports of fish and fishery products grew by 9.5 percent in 2006 equal to US$86 billion and nearly 7 percent in 2007 equal to US$92 billion. The proportion of world fish production (144 million tonnes) that was traded internationally in 2006 represents 37 percent of the total, or 54 million tonnes. Developing countries account for approximately 50 percent of all fish exports with a record net export revenue of US$25 billion (exports minus imports). World imports reached US$96 billion in 2007 but are mostly by developed countries, responsible for 80 percent of all imports by value. This share, however, is falling over time as developing countries are importing more and more, both as raw-material for their processing industry and for domestic consumption.

11. Through trade, globalization is increasingly playing an important role in aquaculture development. Its requirements are two-fold: (a) strengthening of national, inter-provincial or inter-state, as well as regional and international biosecurity and food safety measures; and (b) enhancing the ability, through training, legislation, codes of practice, certification, traceability schemes of governments and producers, to comply with trade and market access requirements for safe and quality products. These requirements are creating a considerable drive for importing and exporting countries to collectively harmonize standards as well as addressing issues such as the certification of products and processes. Further global cooperation and harmonisation of standards for aquaculture production and trade will be important in order to support the increasingly globalized aquaculture sector.

12. As a consequence, policymakers emphasize the need for better governance of the sector. They are aware that policies can be much more effective if producers participate in planning, decision making, management and regulation processes. Such recognition has led some governments to build upon existing national capacities to assist producers and processors to comply with mandatory food safety regulations, whilst empowering farmers and their associations for greater self-regulation. However, this is not always the case.

Small-scale producers and market access

13. Aquaculture is an income generating activity, with significant potential for creation of employment, poverty reduction, community development and food security. It has two distinct facets in terms of production: (a) producing fish for domestic markets; and (b) for international markets. Producing for domestic markets directly improves national food security whilst producing for international markets creates employment, provides income and brings foreign exchange, thereby indirectly contributing to food security.

14. Commercial producers of aquatic food range from a large numbers of small-scale producers to a small number of large-scale producers. Large commercial producers are generally better organised, often vertically integrated along the supply chain, and use capital intensive production systems. They have advantages of scale and are able to compete effectively on international markets. Small producers tend to be less organised, not vertically integrated, rely heavily on service providers, capital extensive, thus, by and large, they continue to cater for

local markets. However, with as much as 80 percent of production in many Asian countries deriving from small-scale producers, it is also evident that a large part of this production, especially shrimp and marine finfish, enters into international trade. This happens through the use of clusters, common collection points and through the activities of buyers who supply domestic processors for exports.

15. Small-scale producers may find it difficult to enter directly into international markets, mainly because international corporate buyers need a regular supply of quality and safe products in large quantities. This however, does not imply that the products from small-scale farms are of sub-optimal quality; however it indicates that these farms are unable to produce regular supplies of large quantities and comply with fish quality, safety standards and requirements of the international markets. They can however achieve this by organizing into groups/clusters (often called producer organizations) which work in a more coordinated manner for export purposes.

16. The growing concentration of distribution at the retail level through large international supermarket and hypermarket chains, as well as the emerging consolidation on the processing side, has created the need for new innovative structures at the producer level through networks of some sort and coordinated commercial activities of paramount importance.

17. In some aquatic commodities and in some countries, the number of mainstream commercial production units are decreasing but their size is increasing. However, as the sector matures and attracts foreign investment, it appears that large enterprises (including multinationals) gradually take the upper hand. If this scenario happens in other commodities that are predominantly produced by small-scale producers and internationally traded, or having potential for international trade, there is a need to assist those small-scale producers to become more competitive in the market. Otherwise, they may loose household income and thus may face food insecurity.

18. In the same manner, small-scale aquaculture producers should be encouraged to explore new organizational structures and innovative commercial arrangements in order to exploit the opportunities offered by globalization and to enter international and regional markets. This has already been demonstrated in many developing countries, particularly in Asia, and not only for high-valued species. In fact, there is also growing regional trade in so-called low-value farmed fish species.

Corporate social responsibility

19. In aquaculture production, as in other agriculture commodities, the choice of crop should be driven by the market. Commodities such as basa, tilapia, etc., grown in Asia and Latin America have been able to penetrate Western markets mainly based on their low prices. Perhaps another way forward for such small-scale operators to gain or maintain market access could be to produce for niche markets. A shift from a production driven approach to a market driven approach with emphasis on the whole supply chain from producer to consumer should be explored. Assisting small-scale farmers to gain market access is increasingly

considered as an important corporate social responsibility of all involved in the market chain. Making this a significant reality is a challenge.

Marine resources and aquafeed

20. Some types of aquaculture rely on wild caught seed and broodstock. Although wild caught shrimp seed are phasing out, in some countries there is still a heavy reliance on wild caught marine fish seed and some freshwater species. Continuing reliance on wild caught seed is a concern for future, and adequate measures are needed to rectify this shortfall.

21. There is a concern that the available marine feed resources (fishmeal and fish oil) may not be sufficient to meet the demand of projected aquaculture production. About 23.13 million tonnes of compound aquafeeds were produced in 2005 of which approximately 42 percent was consumed by aquaculture. The aquaculture sector consumed approximately 3.06 million tonnes or 56 percent of world fishmeal production and 0.78 million tonnes or 87 percent of total fish oil production in 2006 with over 50 percent of fish oil going into salmonid diets. The amount of fishmeal and fish oil used within aquafeeds has grown over three-fold between 1992 and 2006. This increase has been possible as the poultry sector gradually reduced its reliance on fishmeal.

22. Besides fishmeal or fishmeal based diets, an approximate 5 to 6 million tonnes of low-value/trash fish are used as direct feed in aquaculture production worldwide. A recent estimate places the Asian use of trash fish as fish feed at about 1.6-2.8 million tonnes per year. In addition, large amounts, yet to be quantified, are also used by the pet food industry and the fur animal sector.

23. Even though fishmeal and fish oil production has remained stagnant over the last decade, a significant increase is not anticipated in the foreseeable future. There is evidence that the fishmeal usage in animal production sector, particularly poultry, will continue to decrease in the coming years. Furthermore, it is expected that the proportion of fishmeal and fish oil use in aquafeed will also be reduced substantially by the increasing use of vegetable-based protein and oil as well as greater efficiencies in feeding through better feed management.

24. However, the world prices of fishmeal, fish oil and other feed ingredients are rising. The price of fishmeal increased from around US$500/tonne in 2000 to around US$1200/tonne in 2008. The price of fish oil also increased from US$300/tonne in 2000 to US$1800/tonne in 2008. The average price of other feed ingredients, particularly cereal grains and soya bean, also rose by 30-130% during 2007.

25. These price developments are bound to affect aquaculture production. Although tilapia and catfish farming sector uses proportionately low levels of dietary fishmeal and fish oil, varying between 2-7 for fishmeal and 1% for fish oil, the increasing prices of other feed ingredients, particularly the grains, will have a major impact on the feed price.

26. It is important to note that, over the past four years, the price of compound feeds in the salmon sector has only increased by around 15 percent. This is because the sector is highly organised, benefitting from continued research on salmonid physiology which helped in substituting fishmeal and fish oil adequately to keep the price down whilst maintaining the feed quality.

27. Increasing prices of fishmeal, fish oil, grains and other feed ingredients, and also fuel and energy will certainly affect the cost of aquaculture production. With such a scenario can aquaculture farms be economically viable or sustainable? Sustainability remains a concern, however, even more so when the demand for aquaculture products is outstripping the supply, and prices soar so that even inefficient farms might make money.

Environmental and social aspects

28. The environmental impacts of aquaculture development have received a high degree of attention over the past three decades, typically in cases where societal benefits were negatively affected by unregulated aquaculture development, although these claims may not always be supported by hard evidence. With the increasing demand for environmental protection and services in a situation of diminishing land, water and feed resources, this attention is likely to become more pronounced in the coming decades.

29. With weak or improper regulations for the allocation and use of natural resources, conflicts can arise between resource users. Invariably, less influential and disadvantaged stakeholders are denied access to such resources. Unregulated or improperly regulated aquaculture development also results in a high discounting rate on the use of natural resources capacity and, therefore, encourages practices that exploit them beyond renewal.

30. The main concerns articulated by the general public and environmentally conscious community groups will continue to be echoed. These concerns include: (a) sustainability of resources used in aquaculture; (b) impact of aquaculture on aquatic biodiversity; (c) sustainability of fish feed practices; (d) use of alien species in aquaculture; (e) escapees and consequent effects on wild populations; (f) release of organic matter into natural waters; (g) discharge of antibacterial and chemical residues into natural environment; (h) over fishing of wild species for aquaculture; and (i) weakness in spatial planning and competition with other activities, etc. This raises the question of whether the true environmental cost of certain aquaculture practices is adequately known.

31. As a result of strong public scrutiny on the environmental impacts of some types of aquaculture development, significant progress in addressing many of the key concerns in the environmental management of aquaculture has been made. Public pressure and continued commercial necessity have led the aquaculture sector to improve management, reduce its environmental impacts and encourage governments to increasingly recognize that aquaculture, when well planned and well managed, can yield broad societal benefits with minimum concomitant environmental degradation.

32. However, the image of aquaculture, at least among the environmental lobby groups, is still sullied. Since the aquaculture sector still causes negative environmental and social impacts, at least in some production systems and practices, this image remains. Needless to say that all food production systems will have an environmental impact. The question is to what degree a food production sector should perturb the environmental processes.

33. Recent progress leaves no room for complacency. Continuing improvements, policy interventions and investments are required to ensure a higher degree of environmental sustainability and economic viability in the sector as pressure on the natural resource base and public awareness of environmental issues are reaching unprecedented levels. An ecosystem approach to aquaculture development and management can help reconcile the human and environmental objectives of sustainability.

34. Aquaculture can make a positive contribution to environmental restoration and can help reduce the negative impacts of other human activities. Multi trophic aquaculture (growing fish, molluscs and seaweeds together in the same environment) is one such opportunity. Such systems not only contribute to environmental restoration, but also help in increasing production and profit. Inclusion of molluscs in marine and coastal production systems also improves carbon sequestration.

35. Aquaculture, as a source of food, contributes to global food security and poverty alleviation and also has a significant social responsibility. The sector should operate in a socially responsible, environmentally sustainable, and economically feasible manner, contributing to meeting millennium development goals. Is this the case at present? Although many regional and global assessments have been conducted by several agencies including FAO, an objective assessment of the sector's contribution to poverty alleviation and food security, social benefits and contribution to meeting the millennium development goals is necessary.

Diversification and expansion

36. It is natural that successful fish farmers wish to expand and/or diversify their operations. Also there will be newcomers to the industry. The question is whether there will be enough suitable land, fresh or coastal waters for fish farming, globally. There are regional and national differences and some regions and/or countries will have adequate land and water resources whilst others may not. Thus, many countries are seriously considering expanding aquaculture production into marine waters (open ocean aquaculture).

37. The issues are: Are we ready for such a move? Do we have adequate knowledge on the costs and benefits of such a move? Do we have adequate laws and regulations to protect ocean environments from the pollutants and environmental threats arising from such production activities? Where such instruments exist, are there enough resources to implement them? Will open ocean aquaculture be economically feasible? It is imperative that these issues are urgently addressed and research carried out so that the potential negative impacts of open aquaculture could be minimised and its socio-economic benefits maximised.

38. Aquaculture moves forward with improved technology, farmer innovativeness and resilience. Over the past few decades aquaculture technology has advanced tremendously, improving productivity, reducing environmental impacts, increasing profitability and enhancing sustainability. Important improvements in technologies as applied to aquaculture include; recirculation technologies, aquaponic systems, submergible cage culture systems, feed systems, genetic manipulation, disease control and health management, quality assurance and safety of products, good seed and feed and information management.

39. Industrialised production systems are continously developed with increased vertical integration and systems approach to aquaculture. There will be new species, regularly added into the list of cultured species. Therefore there is a continuing need for technological improvements, innovations, and appropriate research. The challenge would be to make the innovations useful and available to the small-scale farming sector, which supply over 80 percent of the global aquaculture production.

40. Genetically modified organisms is a controversial issue in agriculture. Significant research has gone into producing GMO fish and transgenic aquatics, and some are ready to be placed on the market. The global debate on their risks to human and environmnetal health will continue and it is unlikely that GMOs will make a significant contribution to meeting the future demand for fish in the short term.

41. During the past two decades severe production losses in some species due to disease were experienced, making disease one of the most significant constraints to aquaculture development. While we tackle and manage existing diseases, new pathogens and diseases will emerge. Continuing research into all aspects of health management and concerted efforts on reducing trans-boundary spread of pathogens is a must for manitaining sectoral sustainability.

42. Food safety and animal health and welfare are two issues that will continue to attract international policy, regulatory and market attention during trans-boundary trading and movement. For those issues, the global governance insrtruments exist, namely; the Codex Alimentarius and OIE, which are recognised by the World Trade Organization Sanitary and Phytosanitary Agreement (WTO/SPS) as facilitators and regulators of responsible international trading. But, are the standards set by such instruments fully met and complied with the producers and traders? Is the process of setting standards fair and adequately participatory or consultative, and is there sufficient room for developing countries to particpate in a standard setting process? There is a need to look at the effectiveness and efficiency, and identify necessary improvements, of such global governance instruments.

Communication and networks

43. In recent years, the demand for reliable and timely information on the status and trends of aquaculture has greatly increased. The demand stems from the need to formulate, implement and monitor sound policies and development plans, respond to reporting requirements of international agreements and to public demand for

transparency and accountability. There have been many attempts to improve the information base on aquaculture, globally. In Asia, the base for the improvement of information was made possible through more formal networking amongst countries and institutions. There is a thrust and a dire need to establish more networks in other parts of the world. As globalisation proceeds, with increasing flows of products, services and investment across regions, the need for more communication between regions will also increase. New technologies would also enhance and facilitate such progress.

44. Many networks of producer associations and groups assisted by the private sector as well as donor and development agencies do exist and have contributed significantly to the sector development. From aquaculture self-help groups, including women's groups in poor villages in Asia, to the more formal regional and international associations with their headquarters in Europe and the United States of America, producer groups have increasingly been playing a major role in global aquaculture development. The challenge is to establish and empower more and more producer groups so that the aquaculture sector could be better managed by the true owners themselves.

Aquaculture insurance

45. The rapidly increasing production processes involved in aquaculture development (e.g. intensification, use of submergible cages, recirculation systems, aquaponics, etc.) can significantly increase the vulnerability of farms to disease outbreaks, storm damage and other risks. Thus, recently, there has been an increasing demand for insurance schemes to share and cover the risks involved. Aquaculture insurance is a risk management tool and demand for aquaculture insurance schemes is now at an all time high.

46. There are about 8000 aquaculture insurance policies in force worldwide, but these are unevenly distributed across the sector, with few or none in regions such as sub-Saharan Africa, south America and large parts of Asia. Insurance will be an issue requiring due attention in the future by stakeholders, particularly the enterpreneurs, investors and governments. It remains a challenge of applying such financial risk management strategies to small-scale farmers.

Conclusions

47. Aquaculture production is growing and contributing in increasing volumes to national and international demand for aquatic products. This growing sector however needs investment in market services, infrastructure information systems, processing, reliable year-round supply capacity and marketing systems. Whilst doing so, it will be necessary to address the challenges in many markets to environment and sustainability concerns; issues such as carbon neutrality, energy requirements for food production are receiving more attention. There is a drive towards integrating environmental costs into the value chain and markets. Will this be possible? Who will pay?

48. Cnsumer demands for quality, safety and value for price of aquatic products which are on the increase and will continue in the coming years. These demands

include product consistency, reliability of supply, food safety, product choice, and more recently, sustainability of production and social equity. Some of these demands are leading to the need for new standards, and interest in labeling and certification of aquaculture systems and products. Harmonised standards and responsible certification systems are becoming an important concern.

49. Access to capital and investments are a must to sustainable development of the aquaculture sector. However, if the current global economic crisis continues for sometime, the commercial expansion of the sector may be retarded. Adding to the economic crisis, the prices of feed ingredients and fuel are also increasing, and as a consequence the cost of production is increasing. Some farmers are finding it difficult to continue farming certain species, while others are even converting fish farms to rice paddies. The long-term effect of this scenario is unclear and unpredictable; studies are needed in this area.

50. Another constraint to aquaculture development could be the unpredictable and uncharacterized impact of climate change. Climate change presents unquantifiable threats of temperature increase, weather and water supply. The past five years have seen unprecedented impacts on the sector from natural disasters – aquaculture in Aceh (Indonesia), Bangladesh, China and Myanmar have all suffered from severe natural disasters. There is a need for the aquaculture sector to join other economic sectors in preparing to address the potential impacts of global warming, and strengthen the adaptive capacity of aquaculture farmers, particularly more vulnerable small-scale farmers.

51. A counterpoint to the rapid development of global aquaculture is its limited development in sub-Saharan Africa. There is a strong belief that Africa has the full resource potential for aquaculture growth. Although, aquaculture is slowly finding its niche in many countries in Africa, the overall contribution could be improved considerably, making Africa a high priority region for aquaculture development.

Request to the Sub-Committee on Aquaculture

52. The Sub-Committee is requested to advise the FAO Secretariat on the priority activities to be undertaken during the coming years in assisting the aquaculture sector towards meeting the projected demand for aquatic food from aquaculture.