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Outlook for Fish to 2020: A Win-Win-Win for Oceans, Fisheries and the Poor?

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The world has observed an unprecedented rise in production, consumption and trade of fish during last three decades. Developing countries as a whole supply nearly 75% of the fish, and represent 50% of the value of global fish trade. At a time when receipts from traditional agricultural exports have been declining, export earnings from fish seem to be paying the food imports bills in many low-income food-deficient countries. While these trends are likely to continue to 2020, questions are being raised about the integrity of world's oceans and fisheries, and the true role of fisheries in eliminating poverty and improving nutritional security of the poor. This paper reviews the changing structure of fish supply, demand and trade, and investigates the impact of fisheries practices on the natural environment, the crucial role of technology, and the role of policy at both national and international levels. The impact of changes can be most profound on the natural environment, and least beneficial to the poorest people in our world community due to the exclusion of the poor from property rights, technologies and markets; the rising price of low-value food fish to the poor, and the alarming rate of degradation of fisheries and the environment in

developing countries. The complexities of food safety, and public health concerns in the importing countries, can dramatically affect market access by poor citizens in developing countries. Poverty reduction, inclusive development and environmental protection must become more central themes in the dialogue between advocates for the poor and for the environment, representatives of the fish industry, and political leaders and international policy-makers.

1. Structural shift in production, consumption and trade: why should we be concerned?

The world has observed an unprecedented rise in production, consumption and trade of fish during last three decades. Total fish production doubled from the level of 1971 to 130 million metric tonnes (MMT) in 2001. Developing countries as a whole now supply nearly 75% of the fish — 50% of the value — of global fish trade. Asian developing countries alone produce 56% of the total fish (FAO 2004). Technological breakthrough in aquaculture, triggered by increased demand for high-value fish in the world market and simultaneous changes in international laws, treaties and institutions, contributed to this phenomenal growth in the supply of fish. Structural reforms in many developing and transitional countries (e.g. China, Vietnam, India and Thailand), inspired by a new era of globalisation and liberalisation, also contributed to the shifts in the structure of production, consumption and trade in fish. Production from aquaculture, regarded as one of the greatest technological success of the last quarter of the 20th century, grew from only 3.9 MMT in 1971 to 42 MMT in 2001, most of which come from developing countries. It now represents about 32% of total production, up from barely 6% in 1971 (FAO 2004).

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Fish played an important role in doubling animal protein consumption per capita in developing countries in the last thirty years — from 6.3 kg in 1970 to 13.8 kg in 2000. In the developed world, fish consumption increased by less than one half during the same period. In the world, fish consumption per capita increased by 43% from 11 kg in 1970 to 16 kg in 2000. The most significant factors that drove increasing fish consumption in the developing countries, particularly in Asia, are urbanisation, and income and population growth (Dey *et al.* 2004a). These factors are responsible for increasing China's per-capita consumption of fish more than four-fold between 1971 and 2000 (FAO 2003). In contrast, the revolutions in fisheries and aquaculture did very little to raise the levels of production and consumption of fish in Africa, where protein and nutrition deficiencies are common, and persistent poverty and low per-capita income greatly hinder growth in demand for fish.

Another significant aspect of the changing structure of the fish sector is seen in the trade of fish and fish products between the developed and developing countries. This trade has changed both in composition and direction in the last two decades. Exports of high-value products such as shrimps, lobster tails, Nile perch and tilapia filets have made fish important net foreign-exchange earners for many developing countries. Net exports of the developing countries increased by 283% from US\$6 billion in 1980 to US\$23.3 billion in 2001. On the other hand, the developed countries imported 82% of the total value of global fish imports in 1980, and Japan, EU and USA together imported 77% in 2001 (FAO 2004). The current value of global fish trade, estimated at \$56 billion, has surpassed that of many traditional agricultural exports. At a time when receipts from traditional agricultural exports have been declining, export earnings from fish seem to be paying for food imports in many low-income food-deficient countries (Ahmed *et al.* 2003).

While these trends are likely to continue to 2020, questions are being raised about the integrity of world's oceans and fisheries, and the true role of fisheries in eliminating poverty and improving nutritional security of the poor. Many people believe that a huge environmental crisis is looming, while the root cause of the crisis is failure of both perspective and governance (Pew Oceans Commission 2003). According to Delgado *et al.* (2003b) 'the world's fish sector may become a victim of its

own success'. Below, I will examine the outlook for fish supply and demand to 2020, and its implications in terms of opportunities and threats to oceans, fisheries and the poor. The role of technology, and policy support at both national and international levels, has been recognised as crucial for a win-win-win situation for oceans, fisheries and the poor. Much of the analysis in the paper is based on a recent study of the outlook for fisheries to 2020 (Delgado *et al.* 2003a).

2. Outlook for fish to 2020: opportunities and threats for oceans, fisheries and the poor

Policy researchers and economists at WorldFish Center and the International Food Policy Research Institute (IFPRI) used a global model of supply and demand for food and feed commodities, and present trends, to project the likely changes in the fisheries sector over the next two decades (Delgado *et al.* 2003a). The model projects that total food fish supply alone will be 130 MMT in the year 2020, an increase by 40% from the base period 1997. Developing countries will maintain dominance over the production of low-value food fish, whether in aquaculture or capture. The demand for fish in developing countries will burgeon. Supply will further shift toward aquaculture as well as toward developing countries. By 2020, aquaculture may supply 41–51% of total production, while developing countries would continue to lead in both production and consumption of food fish. Food fish supply in China and India alone are projected to increase by 59% and 67%, respectively. Developed countries' contribution of food fish to the global total will fall to 21% in the year 2020, while the remaining 79% will be split between China and the rest of the developing world at the rate of 41% and 38%, respectively.

The projections by Delgado *et al.* (2003a) also show a significant increase in the prices for food fish, fishmeal and fish oil. In almost all projection scenarios, fish are highly likely to become more expensive to consumers compared with other food products. Faster aquaculture growth, assuming much greater technological and policy success, is the only scenario that may lead to a drop in the real price of low-value food fish. This scenario, however, will cause an increase in the prices of fishmeal. Slightly lower prices of fishmeal and fish oil can be expected only through improving technical efficiency in the conversion process.

Net exports from the developing to the developed world are projected to continue to 2020 — though at a lower level than at present mainly because of rising domestic demand for food fish within developing countries in response to urbanisation, and population and income growth. Environmental controversy will change its focus — there will be a larger constituency worried about pollution and food safety issues. While more and more developing countries will be involved in south-south trade, the Africa region as a whole and part of south Asia (excluding India where fish is less important in the daily diet of the population majority) will become net importers.

Overall, excess demand (where demand outstrips supply) will create a sharp increase in fish price. Poor people are most likely to feel the pinch of higher fish prices, as prices of many low-value food fish are also likely to increase. Emphasis on higher export earnings from fish, encouraged by lucrative international markets, may make domestic fish resources in developing countries more vulnerable to over-exploitation. Efforts to recover stocks that are already deteriorated may be sacrificed or traded for short-term economic gain. However, there are number of areas where simultaneous progress will benefit poor people as well as ensure sustainability of oceans and fisheries.

2.1 Governance and institutional devolution

International treaties and conventions have played a vital role in the rapid expansion of markets and national fishing capacity, and application of modern fishing techniques. Creation of exclusive economic zones (EEZs) and implementation of the 1982 United Nations Convention on the Law of the Seas (UNCLOS), along with various other conventions — such as the Convention on the Biological Diversity (CBD), the Convention on the International Trade of Endangered Species (CITES), and conventions on management of shared stocks like tuna — provided not just fishing rights over extended areas of the sea to coastal states: it also increased the management responsibilities of the nations in question (Ahmed *et al.* 1999). The new fisheries regime, however, also encouraged devolution of governance of fisheries and ocean ecosystems and more decentralised and participatory management systems.

Many countries have in principle adopted policies of decentralised governance and institutions that

are expected to create conditions for further devolution of fisheries governance. Although instruments for devolving fisheries management are still not fully developed, and progress toward implementations had been slow, there are examples, in many sites and parts of developing countries, of common-pool fisheries resources being released to the community under co-management or partnership arrangements (Gardiner and Viswanathan 2004). Evidence suggests that these arrangements have had enormous positive impact on incomes and livelihoods of poor fishers, as well as significantly improving management of the resources. Overall improvement in political governance is still seen as a pre-condition to improving fisheries governance, especially if institutional changes have to make any profound impact on the livelihoods of the poor people dependent on fisheries in the developing countries in the coming years.

2.2 Integrity of environment in relation to aquaculture and fisheries technology

The capture fisheries in both inland and oceans, and aquaculture in both freshwater and brackish water, have raised concerns for the long-term sustainability and integrity of the aquatic environment. Fishing activities have led to perpetual overfishing, discarding of a large quantity of by-catch, habitat destruction and ecosystem modifications (Hall 1999). Overexploitation of fisheries has posed the greatest environmental threat to the world, especially to the fish habitat and species diversity (World Bank 2004).

Technological advances in past decades have produced extra pressure on fishery resources and habitats. Most wild stocks are classified as fully exploited, and the number of over-exploited stocks has been increasing (FAO 2002). The problem of by-catch, estimated at 20 MMT annually, has further aggravated the inability of stocks to replenish (FAO 1998). Many activities and fishing techniques, such as reef, blast and poison fishing, and deep-sea trawling, kill organisms on and within the seafloor. Trawling removes important benthic structure-forming fauna, causing irreversible harm to the population dynamics of the seafloor habitat (Hall 1999).

Practices in high-value aquaculture, such as shrimp and salmon, are also considered to damage ocean and coastal resources (Naylor *et al.* 2000). Genetic interactions between escaped fish stocks and wild

stocks have also raised significant concerns for marine biodiversity. On the other hand, most of the aquaculture practices in developing countries — in particular fin fish aquaculture of the tropics — have remained relatively less threatening to environmental integrity, as these practices usually rely on semi-intensive and photosynthetic feeding regimes (Williams *et al.* 2000). The integrity of these practices will, however, depend on the ability of the aquaculture industry to develop or adopt sustainable intensification in the coming decade.

2.3 Poverty reduction and food security

Reducing poverty and improving nutritional security of the poor people is a continuing global challenge. High demands and high prices for fish can be an opportunity or a constraint in meeting this challenge. In small ponds and ditches, aquaculture has been seen to increase income and employment of poor fish farmers, women and children, while providing employment on large farms, seed supply networks, market chains and processing industries. In addition, development of aquaculture in natural open waters through cage culture has created opportunities for poor and landless farmers to derive income through sale of relatively high-value fish.

Adoption of semi-intensive aquaculture entailing regular stocking, supplementary feeding and timely harvesting in China, India, Bangladesh and Vietnam has led to increased household income as compared to traditional fish pond operation making little use of these practices (Ahmed and Lorica 2002). Likewise, evidence suggests that a significant proportion of the household consumption of fish came from on-farm production (Dey *et al.* 2004a). In rural areas, average per-capita consumption is higher for fish producer households than for non-producers (Dey 2000, 2003).

Unfortunately, due to policy bias and huge gaps between research and development and adoption, uptake of small-scale aquaculture by poor households may be only short-lived, unable in the long run to face resource competition and market trends. While in developed countries fisheries subsidies distort markets and operate against the interests of poorer fishing states, in many developing countries too public policy subsidises capital-intensive large-scale operations at the expense of traditional fishers and fish farmers. High-value food-fish aquaculture continues to receive substantial policy support and incentives, such as cheap

land, credit and low tariffs on imported inputs (Ahmed 1997). Developing countries lack legal and institutional framework to promote access and user rights of the fisher community, and infrastructure and extension services to small operators.

Higher fish demand in the world market and the consequent higher prices of fish products provide incentives to produce high-value fish for export, replacing low-value food fish for domestic consumption. The impacts of this trend on the landless and subsistence farmers in the developing countries could be huge. Even if some of the poor fish farmers are able to produce high-value fish and potentially benefit from higher market prices, many emerging constraints in market and trade areas may preclude the poor altogether.

Changes in production, consumption and trade patterns for fish will attract investment in lands and capital for high-value food fish production, thereby replacing low-value aquaculture usually undertaken by small-holders and poorer segments of the population. Liberal trade regimes may also worsen the imbalances in consumption between developed and developing countries and among economic classes. It is also feared that trade liberalisation will divert fish products and their inputs to markets with higher purchasing power.

2.4 Market access for the poor

The poor lack access to markets, and often suffer from disadvantages caused by uneven distribution of resources. Women, who traditionally participated in the marketing and processing of fishery commodities, are being cut off from the supply chain due to changing requirements of supply, use of new technologies and the demand pattern for products. The compounding effects of food safety regulations, such as sanitary and phyto-sanitary (SPS), hazard analysis and critical control point (HACCP) processes, and technical barriers to trade (TBT) have already introduced high costs that tend to exclude small producers and processors from the export supply chain (Cato and Santos 1998; Ahmed *et al.* 2003; Dey *et al.* 2004b). Traditional market chains — usually long — may no longer be viable for the poor, and in effect make it costly for many developing countries to compete in the world market. Poor fishers and fish farmers in developing countries need assistance and support to adopt improved technology for efficient management to minimise costs of HACCP processes, to realise benefit from fish trade.

In addition, the growth in fish trade has both positive and negative impacts on the livelihoods of the poor fishers and farmers in the developing countries. Diversion of a significant amount of food fish from local communities and from developing regions may have harmful effects on poor people and children, and fishing families (Kent 2003). This deprives them of their traditional right to cheap nutritious food, especially when the diversion occurs without increasing the supply of fish within the local communities (FAO 2000). Micro-level studies indicate that more than half of the children of fishing families in Indonesia are stunted (Gross *et al.* 1993), and infant mortality in Indian fishing villages is high (Kumary 1991). Ironically, both these countries are among the leading exporters of fish and fish products in Asia.

Sustainability is still dependent on availability of alternative fish feed and animal feed. High-value cultured products such as shrimp and salmon, and animal fattening, require low-value fish and wild catches that could be made available for consumption by poor people through alternative products, markets, infrastructure and policy support (Kent 1995). In 1999, 28.5% (26.5 MMT) of the total fish and shellfish catch was used for reduction for animal feed production (FAO 2002).

3. Way forward for a win-win-win: needed actions

Current trends in the fish sector pose serious risks to the environment, to the wellbeing of poor people, and to the viability of the fish sector itself. The impact can be most significant for the poorest people in our world due to exclusion of the poor from property rights, technologies and markets; rising prices of low-value food fish to the poor; and an alarming rate of degradation of fisheries and the environment in developing countries.

Policies, institutions, markets and technologies need to be responsive to the increased need for supply of food fish in the future, and the resulting environmental consequences of aquaculture and fisheries development. Below, I discuss what technological and policy questions should be addressed; and what elements in both aquaculture and capture fisheries should be targeted for future technology development and policy support, to ensure food security to the poor people of the developing countries and to maintain the integrity of oceans and fisheries.

Pro-poor technology and policy support

Achieving food security for the subsistence farmers and fishers in the developing countries is complex task, and requires multi-dimensional solutions. Poor people in developing countries have few or no resources. Access to resources and markets, establishment of property rights and increased productivity are the main means to increase the livelihoods of these resource-poor people. Government policy interventions and support services such as subsidised credit and infrastructure, and low-cost and low-input technologies, can inject entrepreneurship amongst poor people, enable them to gain access to resources, and help increase productivity and income.

Technologies for sustainable fisheries, aquaculture and environments

In marine fisheries, technological development can focus on minimising pollution, habitat degradation and wasteful catch, and improve post-harvest management that will indirectly help to increase fish production. Application of satellite technology to generate information on characteristics of species, to monitor deep-sea fishing activities and to aid communication to facilitate rapid landing can address some of the crucial needs of fisheries management. Improving the existing by-catch reduction devices (BRDs) can also address the problem. Technology should address damage to the sea floor by commercial fishing vessels by modifying existing gear.

Developing countries need to develop efficient and transparent management systems for their inland open water and marine resources, as they have severe problems in managing fisheries dominated by small-scale and subsistence fishers. Efforts are still needed at the international level to improve regional and international cooperation on IUU (illegal, unreported and unregulated) fishing, and adoption of improved policies and technologies.

Continued investment in research and innovation is needed to further advance aquaculture technologies — both in genetics and in cultural practices. There is potential to improve the quality of both finfish and shellfish through selective breeding and biotechnology. Research shows that intensive cultural practices are economically inefficient and environmentally unsafe. Semi-intensive cultural practices are low cost and require small external inputs, are economically desirable and environ-

mentally friendly, and are easily adopted by the poor (Dey *et al.* 2000). Policy actions are needed to devise a framework for developing and prioritising technological packages that are pro poor, economically efficient and environmentally safe.

Fisheries and ecosystems

Aquaculture can have enormous impact on the environment and biodiversity. Many people believe that aquaculture can sustainably ease pressure on threatened wild stocks, provided it can address its own environmental problems — ranging from effluent discharge and pollution to high rates of fishmeal and fish oil use, and habitat destruction in tropical countries.

Fisheries management should be improved by developing appropriate technology that will be able to provide accurate information about the location, size, structure and growth potential of stocks in river and ocean environment. Technology development in aquaculture and fisheries should minimise adverse effects on the environment and fisheries habitat, in both ocean and inland waters. Research should seek nutritionally comparable alternatives to the capture fishery-derived feed inputs — from by-products of oilseeds, grain, vegetables and animals.

Fish for the poor at affordable price

The rising price of low-value food fish to the poor is a real policy concern. Semi-intensive and photo-synthetic aquaculture of low-value food fish has the potential to be adopted by millions of small-holders in tropical developing countries, and may emerge as an environmentally-friendly production system and at the same time supply large quantities of low-value food fish. Policy-makers need to think about investments needed in developing technologies, using genetics and biotechnology, for augmenting yields and creating competitive advantage for millions of small-scale producers to supply massive quantities of low-value food fish at affordable prices. Similarly, a balance between fish trade and domestic consumption should be maintained: otherwise trade will have enormous impact on food security of poor people in developing countries.

Aquaculture for the poor

To get the most benefit for poor fish farmers, productivity of small-scale aquaculture should be in-

creased. This can be achieved through the development and enhancement of their production systems and through the devolution of institutions and management approaches that will ensure access to resources and property rights, and provide an equal opportunity for the poor to access inputs and markets.

Many of the problems in aquaculture can be removed by introducing effective management strategies like land and water management, and disease control. Policy research should identify appropriate incentive structures to minimise distortion in allocation of resources and their degradation. Policy actions are needed to prevent all benefits of aquaculture development being captured by commercial ventures at the expense of subsistence and small-scale fishers and farmers.

Balancing fish trade for the poor

Trade remains a potentially volatile area of tension between the developed and developing countries, and between the poor and the rich. The complexities of food safety and public health concerns in importing countries can dramatically affect market access by poor citizens in developing countries. Poor people are facing new barriers in both their production and consumption of fish. Developing countries that can address new hygiene and food-safety requirements, fair labor practices and environmental needs will have the opportunity to capture more lucrative export markets. If the poor are to benefit from this potentially profitable activity, however, policymakers will need to find ways of including smaller-scale producers in those arrangements.

Representatives of fish industry, political leaders and international policymakers should identify measures to reshape global trade arrangements, as well as fish sector policies on production and post-harvest technology, marketing and resource use, that are consistent with efficiency, equity and sustainability of aquatic resources. The aim should be to establish a trade environment which provides greater access to export markets and a fair share of the benefits of trade to poor people.

Harmonising policies at the international level

In both developed and developing countries, politicians can establish policies and promote institutions that will lead to the most sustainable

management of fish resources while also ensuring the survival of small-scale producers. To improve policy outcomes in the developing countries, policymakers in the developed countries should rationalise their food safety systems for seafood imports, harmonise and modernise tariff classifications, and offer technical assistance in ecolabelling and food safety to small-scale fish exporters. The focus of demand-side policies in developing countries should be to facilitate south-south trade on low-value food fish, to provide public goods to assure domestic food safety, and to help ensure that fish products reach those in developing countries who need them the most. Poverty reduction, inclusive development and environmental protection must become more central themes in the dialogue between advocates for the poor and for the environment, representatives of the fish industry, and political leaders and international policymakers.

4. Conclusion

By taking account of the major shifts occurring in the fish sector and combining forward-looking policies with investment in useful new technologies, policymakers can help ensure that the fish sector remains environmentally sustainable as well as beneficial for the world's poor people. The key questions in front of us are: (1) how to turn higher aquaculture growth into an advantage; (2) which technologies and species will provide the best alternatives; (3) are there southern models for managing capacity and conflicts in fisheries; and (4) how to avoid and reverse ecological collapse in developing country fisheries. In addition, a broad range of strategies that look beyond the narrow perspective of production and management are the ones that can provide a win-win-win solution for oceans, fisheries and the poor.

Harnessing multi-level benefits from the fish sector

It is important to recognise the multi-level benefits and links that fisheries provide in the national economies of poorer countries, such as contributions to macroeconomic growth through trade and domestic resource mobilisation, as well as the micro-level support to the incomes and livelihoods by which the poor can benefit directly. Low-income food-deficient countries (LIFDCs) or net food importing developing countries (NFIDCs) that are also significant fish producers have used a large

share of their foreign exchange earned from fish exports to help pay for large imports of food. At the micro level, fish and livestock are key sources of income, and buffer against food insecurity at times of shortage. To ensure a broader role for fisheries in poverty elimination and food security, national and international policies should use fish as a factor. Although only recently has the role of fish in food and nutritional security become a topic of discussion, fish is now being integrated into the global model for food projections (Delgado *et al.* 2003a).

Research and innovation to directly target the poor and environment

Support for innovation and development in fisheries is crucial to increase and sustain their contribution to poverty reduction and elimination of hunger. Increased public support is justified given the low level of resources fisheries now receive, and in view of their tremendous potential in the future. The relatively high price and continued strong demand for fish, both domestically and internationally, make a good business case for investment in research and development to ensure greater productivity from aquaculture and sustainable management of wild stocks.

Coherence and comprehensiveness of policies

There is no substitute for coherent policies that allows poor people to stay competitive. The coherence of government policies in supporting the fight against hunger deserves analysis. For instance, policies aimed at ecolabelling of fisheries (and the introduction of sustainable fisheries management through market forces) may have adverse effects on the equity of benefits derived from those fisheries unless policies are developed in mutually reinforcing ways. Governments in developing countries have not channelled the benefits of exports back to the poor people on whose contributions the exports have depended. There are many examples where trade-dependent growth or technology and credit support to the poor could not be sustained, to the detriment of interests of the poor. Trade has made many poorer economies less stable, or deprived poor people of their traditional livelihoods. Countries often find it difficult to absorb shocks arising from sudden changes in foreign demand for domestic exports. To guard against these risks, national trade and macroeco-

conomic policies need to work hand-in-hand with micro-level social and economic safety-nets.

Fish as an entry point for integrated rural development

Fisheries and aquaculture provide a good example of integrated rural development in developing countries. The fish sector provides diverse options and opportunities for rural poverty elimination through the creation of livelihoods, income and jobs, including employment for women. Artisanal fishers are routinely amongst the poorest of the poor. By linking fisheries and aquaculture to rural development one can reduce the vulnerability of specific groups of poor in a community dependent on fish for their livelihoods, and can provide additional means of escaping poverty and hunger. Options for sustainable resource exploitation should be enhanced through support for research and innovation within the context of rural development.

Good governance — a key factor

Increasingly, lack of good governance and true democracy that empowers poor people rather than strengthening those in power is recognised as the most important single factor hindering progress toward eradication of hunger in many parts of the world. Corruption stemming from illegitimate and undemocratic government has produced adverse consequences in economic, financial and resource management in many countries. It has created social, cultural, ethnic and religious rifts within nation states. International efforts to eliminate poverty and hunger should make a more forceful statement in promoting good governance and grassroots democracy.

Goodwill and constituency building

Implementation of the reforms in market access, trade barriers and tariffs, perceived as necessary by many analysts, will require significant goodwill on the part of richer nations. Many of these reforms can come only when there is a greater awareness within civil society in the advanced countries of its role and responsibility in the war against hunger. In the absence of this awareness, governments in advanced countries will have difficulty harmonising domestic policies (e.g. support for domestic agriculture and marketing of industrial products) with those that affect international trade with developing countries, without risking adverse public opinion and inaction on desirable

global commitments. Politicians, international organisations and civil society groups should encourage greater public support, in both developed and developing countries, for the cause of oceans, fisheries and the poor.

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