

Introduction

South Asia is home to nearly 40% of the world's poorest people, those who survive on less than a dollar a day. India has the world's highest proportion of malnourished children, with 46% of its preschoolers underweight. Closely following are Nepal with 45%, Pakistan with 38% and Bangladesh with 37% (table 1 on final page). In Sri Lanka, 29% of preschoolers are underweight — a figure that may rise as the end of a decades-long insurgency in the north and east improves survey teams' ability to evaluate conditions there.

The combined population of these five countries is expected to rise from the current 1.5 billion to 2.2 billion by 2050, with the biggest increases occurring in rural areas where the poorest people live. Together, population growth and global climate change (sidebar 2 on page 2) threaten to reverse hard-won gains against extreme poverty and hunger.

Where to focus

The value of improving access for the poor to nutritious fish is most evident in Bangladesh. Bangladesh is ideally suited for fish production, with 1 hectare of water for every 20 people. Consequently, Bangladeshis — three quarters of whom live in rural areas and depend largely on agriculture and natural resources for food and livelihoods — derive 60% of their dietary animal protein from fish, confirming the old Bangali proverb, "Rice and fish makes a Bengali."

The equivalent figure for Sri Lanka is 52%, Pakistan 32%, India 14% and Nepal 10%. Another 1.7 million tons of fish per year will be required by 2020 just to maintain current consumption levels in South Asia, with India and Bangladesh facing the biggest shortfalls of this "rich food for poor people" (sidebar 1).

What to focus on

These five South Asian countries have great potential to expand and intensify aquaculture to meet rising demand and contribute to poverty reduction and rural development. Further, fish and shellfish production can play a vital role in the national economy and international trade. Fish production is notable for its flexibility in combination with other smallholder livelihood options and its dynamism in that it is many smallholders' best bet for earning cash income, requiring little supporting infrastructure. Because fish is a highly traded commodity, fish markets respond quickly to economic upswings. They are also particularly sensitive to downturns and external shocks.

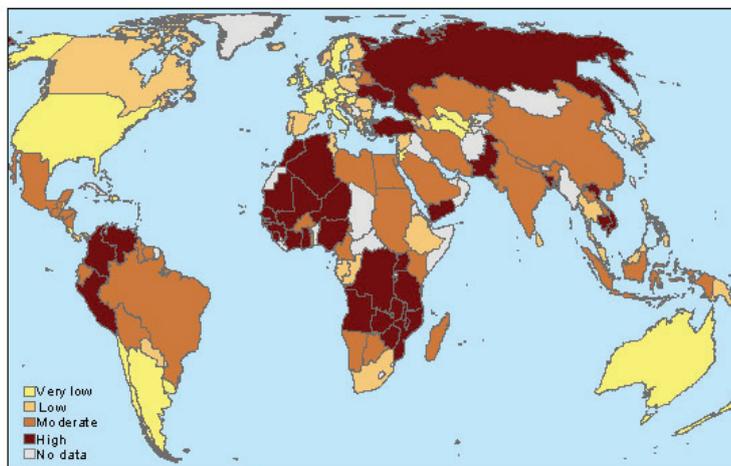


Figure 1: Vulnerability of national economies to potential climate change impacts on fisheries by quartile (dark brown for highest risk, yellow for lowest and gray where no data are available)
Source: Allison E, et al. 2009. Vulnerability of national economies to the impacts of climate change on fisheries. *Fish and Fisheries* 10(2):173-196.

Sidebar 1. Rich food for poor people — especially for women and children

Fresh fish is 18-20% protein by weight and contains all eight essential amino acids. It is a rich source of vitamin A for good vision and robust immunity, B vitamins for metabolizing energy, vitamin C to aid the absorption of iron and fend off anemia, and vitamin D for bone growth. These nutrients are lacking in diets dominated by starchy staple grains and tubers.

The persistence of undernutrition in South Asia has a widely recognized gender dimension. Low birth weight and high rates of childhood undernutrition in South Asia are partly explained by the low status of women, which limits their ability to make decisions regarding the nutrition and health of their children — or themselves.

Addressing gender inequity in South Asia and the resulting generational chain of undernutrition is a complex challenge. A good starting point is making more fish available to the poor. Whereas poor households typically allocate to men larger shares of high-value foods, studies have shown that fish is portioned out more equally. Further, fish is a highly traded commodity. As women are prominent in fish processing and trade, expanding local fish markets promises to empower women by improving their incomes and raising their public presence in commerce.

Fish Supply and Food Security in South Asia

Aquaculture has expanded steadily in South Asia in recent years, now contributing 40% of total fishery production in the region. India is the largest producer, with 3.1 million tons of aquaculture product per year. Bangladesh follows with 0.9 million tons, which is more than twice Indian production per capita. Nepal, Pakistan and Sri Lanka lag far behind. In both Bangladesh and India, aquaculture is emerging as a prime rural industry, contributing to employment, food security, poverty reduction and export earnings. Exports of aquaculture products earn Bangladesh half a billion dollars per year, making them the country's second-biggest earner of foreign exchange, after textiles.

On low-lying river deltas, notably the vast delta of the Ganges and Brahmaputra rivers shared by Bangladesh and India, ponds materialize as farmers remove soil for a plinth to raise homesteads above flood levels. Fish culture in ponds and lakes began on the Indian subcontinent in 350 BC. In modern times, Sundar Lal Hora, director of fisheries in Bengal from 1932 to 1947, is credited with the first successful pond culturing of fish in what was then a British-ruled province and is now divided between Bangladesh and India.

The late 1980s brought recognition that millions of neglected water bodies across Bangladesh could be stocked to provide additional fish to feed a growing population. The area of cultured ponds in Bangladesh has almost doubled since then, and the contribution of aquaculture to the country's total fish output increased from 18% in 1986 to 38% in 2006. As climate change brings seasonal water shortages to Bangladesh, ponds and wetlands will become increasingly important as surface freshwater storage for multiple uses.

Freshwater aquaculture for the poor. Today, three quarters of rural Bengali households practice some form of freshwater aquaculture, culturing some 10 million ponds, most of them measuring less than 400 square meters. Yet yields can be doubled or tripled if fish farmers are helped to overcome the constraints of inadequate technical knowledge, high prices for feed and other inputs, poor-quality fingerlings, inadequate business sense and lack of credit.

Where they have been adopted, faster-growing tilapia strains and new techniques for culturing fish on seasonal floodplains have boosted yields in Bangladesh. Research on biodiversity and productivity parameters in various types of water bodies toward refining low-input aquaculture

Sidebar 2. Vulnerability to climate change makes Bangladesh a workshop for resilience

Climate change must be considered when developing and intensifying aquaculture, to ensure that the technology builds farmer resilience by minimizing exposure and sensitivity to risks and maximizing adaptive capacity. Aquaculture must not draw excessively on water supplies and other ecological services. Adopting an ecosystem approach to aquaculture development helps ensure its sustainability and equitable delivery of benefits, even under the challenges posed by climate change.

Bangladesh and Pakistan are among those countries most threatened by climate change. Bangladesh is perhaps uniquely vulnerable to expected changes in river flows, as the summer flow of the Ganges could drop by as much as two thirds, diminishing vital river and floodplain fisheries. Reduced river flows and rising sea levels already conspire to worsen saltwater intrusion into freshwater habitats. And a low-lying coastal country such as Bangladesh is especially vulnerable to tropical storms and storm surges, which will likely become more frequent and severe with global warming.

Bangladesh has many lessons to teach a world increasingly imperiled by climate change. In November 2007, Cyclone Sidr tore across the country, taking 3,000 lives and leaving hundreds of thousands homeless and destitute. Research in the aftermath found that a small fishpond can be a significant asset to farmers in cyclone-prone areas. Fish hurriedly harvested from damaged ponds provide food when households need it most. Most farmers were able to repair their ponds without assistance and, when provided with starter kits of fish seed and other basic inputs, quickly restore their productivity.

As climate change will likely worsen water scarcity in much of South Asia, and as development intensifies competition for this vital resource, it is significant that the water cost of a kilogram of cultured fish can be as little as 2,000 liters. This is twice the water cost of wheat but similar to that of broiler chickens or milk, 40% that of rice or cheese, and 2% that of grain-fed beef. Further, rainwater stored in fishponds is often available for irrigation after other sources have dried up, and water percolating from fishponds helps recharge local aquifers.

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technologies has brought further gains for participating fish farmers and secondary adopters. These techniques require scaling out to benefit more fish farmers in Bangladesh and the rest of South Asia.

Bangladesh has 2.6 million hectares of rice paddies suitable for fish culture, but rice-fish culture has so far spread to only 10,000–20,000 hectares. A constraint on expanding rice-fish culture is the limited availability of high-quality fish seed. Research in Bangladesh on decentralizing fish seed production needs to be scaled out to help fish farmers across South Asia produce large, high-quality fingerlings to stock their rice paddies and those of their neighbors.

An attractive option for the landless is fish cage culture using net boxes placed in open water bodies. Landless adopters of cage culture have expressed amazement that they can successfully engage in aquaculture without even owning a pond. Begun only in 1997, this practice is developing into a highly commercial enterprise and has great potential where access can be secured, in brackish-water environments as well as freshwater.

Improved quality in brackish-water aquaculture. New models for high-yielding brackish-water polyculture in rotation with saline-tolerant deepwater rice have demonstrated substantial benefits for disadvantaged farmers in the highly dynamic deltaic plains. Similarly, improved shrimp technologies and a more developed value chain have helped ensure a sustained supply of shrimp postlarvae screened for white spot disease, improving yields and incomes where shrimp farmers have access to them. With salinity rising in deltas, improvements in brackish-water aquaculture need to be replicated on a wider scale.

As modernization and urbanization bring rapid change to coastal areas, which are typically poverty hot spots, the dual challenges are to ensure that coastal development is environmentally sustainable and socially equitable. Protecting small fisheries as population and industrial centers encroach is a strong entry point for addressing concerns about sustainability and equity. The displacement of small coastal fisheries can undermine even the aquaculture that nominally replaces them, as poor fishers provide the fry upon which those who culture high-value shrimp and crabs depend.

A stronger supply-and-value chain. Fish production exists in the wider economic context of a supply-and-value chain beginning with inputs and extending through postharvest services, processing and marketing. Although constraints to growth occur all along the chain, marketing infrastructure has so far received less attention from planners and is generally little developed. Downstream producers and traders are plagued by primitive infrastructure and weak links in a long supply chain.

Export-oriented aquaculture in South Asia must adapt to evolving international sanitary requirements to maintain market access. Traditional methods of preservation and processing and artisanal marketing chains often fail to comply with standards, and bans and/or shipment rejection by importing countries can cause massive economic losses to exporting countries like Bangladesh. More investment is required in improved technologies, farmer organization, value chain development and better governance to support a more competitive industry that can generate wealth in rural communities in South Asia.

In South Asia, as in the rest of the developing world, artisanal fisheries and smallholder aquaculture are strong multipliers of local employment — not only in production but also in support services both upstream and down. Small fisheries in developing countries directly employ 25–27 million fishers, fulltime or part time. As another 68–70 million people work in postharvest activities, small fisheries provide over 90% of all fishery jobs. Women account for about half of the total fishery workforce, both fulltime and part time, in developing countries. Women often work in processing and marketing. The benefits to women improve not only their family income and nutrition, but also their social standing, which is important given the very low status of women in South Asia.

Aquaculture-related microenterprises, such as netting teams that provide harvesting services and itinerant traders of fingerlings and food fish, can generate income for the very poor, including the landless and ethnic minorities. Tapping the latent dynamism of marginalized people requires research to identify appropriate microenterprise pursuits and extension services to teach beneficiaries the skills they need to succeed.

Sustainable community fishery management. While the scope for expanding capture fisheries in South Asia is limited, they remain vital to the well-being of fisher communities and the poorest of the poor, in particular the landless. They are essential sources of nutrition, employment and income in many coastal and rural areas. In addition to fulltime fishing, seasonal or occasional fishing supplements other livelihood activities as a recurrent

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sideline, a stopgap providing fish to eat and sell during the hungry season before agricultural crops can be harvested, or a failsafe when harvests fall short.

Over half of the catch in developing countries comes from small fisheries, and fully 90-95% of this catch is destined for domestic human consumption, not for export or use as animal feed. This illustrates how strongly small fisheries contribute to local food supplies and food security.

Carefully managing small fisheries and less-intensive aquaculture helps maintain such ecosystem services as conserving wetland and coastal biodiversity and habitats. Healthy wetlands, mangroves and coral reefs not only help ensure the sustainability of fisheries but also support tourism and preserve communities' cultural capital. Fish production is environmentally friendly as well because it is energy efficient and produces relatively small quantities of the greenhouse gases carbon dioxide and methane that escape from livestock and plowed soil. While the potential benefits of investments in fishing energy efficiency and emission reduction are minor, the sector does provide opportunities to improve livelihoods and environmental and resource management in ways that mitigate climate change.

In South Asia opportunities exist for enhancing fisheries in inland waters with the release of carp and other fingerlings and better management of floodplain fisheries. Many Indian reservoirs seriously underperform their potential. In Bangladesh, the community-centered approach to fishery management and governance has boosted catches and improved the livelihoods of some of the poorest participants, while enhancing fishery biodiversity and sustainability. Success has convinced the government of Bangladesh and many project donors to adopt most elements of the community-centered approach.

Table 1: Human development indicators reveal persistent poverty and hunger in South Asia

Country	Population 2007	Population under-nourished 2002/04 ^b (%)	Population under-nourished (no.)	Wasting	Stunting	Underweight	Fish dietary protein / animal protein (%)	Population <\$1 a day 1990-2005 ^a (%)	Population <\$1 a day (no.)	Population <\$2 a day 1990-2005a (%)	Population <\$2 a day (no.)	Target country for Aquaculture	Target country for SSF
Sri Lanka	19,299,000	22	4,245,780	14	14	29	52.3 ^c	5.6	1,080,744	41.6	8,028,384	√	√
India	1,169,016,000	20	233,803,200	19	38	46	14.2 ^c	34.3	400,972,488	80.4	939,888,864	√	√
Pakistan	163,902,000	24	39,336,480	13	37	38	31.6 ^g	17	27,863,340	73.6	120,631,872	√	√
Bangladesh	158,665,000	30	47,599,500	13.5 ^e	48.6 ^e	37.4 ^e	71.5 ^d	41.3	65,528,645	84	133,278,600	√	√
Nepal	28,196,000	17	4,793,320	12	43	45	10 ^f	24.1	6,795,236	68.5	19,314,260	√	√

Notes:

^a Human Development Reports: <http://hdr.undp.org/en/statistics/data/>

^b UNDP: <http://hdrstats.undp.org>

^c ftp://ftp.fao.org/FI/DOCUMENT/tsunamis_05/issues/fish_and_nutrition.pdf

^d http://www.hki.org/research/pdf_zip_docs/FactsFigures_NSP%20AR%202005.pdf

^e <http://www.reliefweb.int/rw/RWFiles2009.nsf/FilesByRWDocUnidFilename/NSPR-7S>

^f http://www.fao.org/fishery/countrysector/FI-CP_NP/en

^g <http://www.unu.edu/Unupress/food/8F173e/8F173E0b.htm#TABLE%207>

Source: WorldFish Center



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