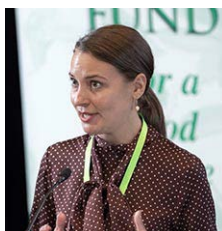


Small fish, big impact: nutrition-sensitive approaches to fish agri-food systems

Dr Jessica Bogard & Dr Shamia Chowdhury

CSIRO & WorldFish

Abstract



Fish plays a vital role in the nutritional quality of diets in Bangladesh, especially for the poor. It is also inextricably linked to the culture of Bangladeshi people and supports the livelihoods of more than 17 million people. Nutrient composition analysis has shown wide variability in the nutritional value of different fish species, with small indigenous fish species (SIS) being particularly rich sources of iron, zinc, calcium, vitamin A, vitamin B12 and other micronutrients, in comparison to commonly farmed species. Given widespread malnutrition issues in Bangladesh, there is significant opportunity for fish to play a greater role in contributing to improved food and nutrition security. WorldFish and partners have developed a package of approaches to maximise the benefit of fisheries and aquaculture for nutrition outcomes among vulnerable groups through nutrition-sensitive fish agri-food systems. These involve inclusion

of nutrient-rich SIS in pond polyculture systems, enhanced stocking of SIS in wetlands, integrated vegetable production on pond dykes and in homestead gardens, simple processing of fish to improve suitability for consumption by infants, and engaging women in fish harvesting to promote frequent consumption of SIS by women and children. These activities are supported by broader approaches including transforming norms, attitudes and practices around gender equity, and social behaviour change communication for improved nutrition and hygiene practices. The integrated and multi-component nature of these approaches has shown numerous benefits for nutrition, gender equity, income and livelihoods. Nutrition-sensitive approaches to fish agri-food systems are central to contributing to the Sustainable Development Goals in Bangladesh and beyond.

Dr Jessica Bogard: As a nutritionist I am absolutely thrilled to present this paper at today's conference. Having first attended a Crawford Fund conference a couple of years ago as a Crawford Fund Scholar, when the conference theme was on feeding the nine billion, it is a pleasure to see that this year's theme is how we can nourish the growing population, and to present part of our study on nutrition-sensitive fish agri-food systems.

Bangladesh is a South Asian nation of 160 million people, situated at the convergence of three of the world's largest river systems: Ganges, Brahmaputra and Meghna. It has extensive floodplains and is very rich in aquatic resources

This paper has been prepared from a transcript and the illustrative slides of the presentation.

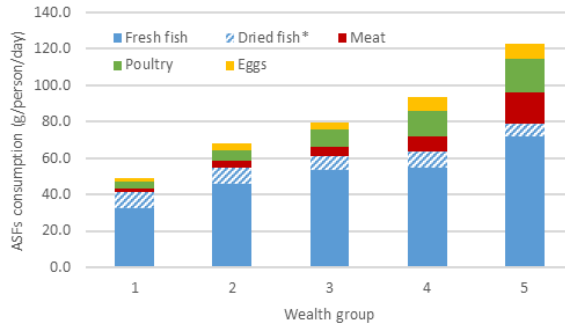


Figure 1. Animal-source food consumption in Bangladesh (g/person/day) (Bogard *et al.* 2016).

which form a vital part of the economy, livelihoods, the culture and local food systems. Fish, rice and pulses form the traditional diet, which is epitomised in the proverb ‘Machh-e Bhat-e Bangali’ which translates to ‘Fish and rice make a Bengali’.

Figure 1 shows animal-source food consumption by different wealth groups. Fish, shown in blue, is by far the most important animal-source food across all wealth groups, though it is consumed in relatively smaller quantities by the poorest (group 1).

While progress has been made, malnutrition remains a pervasive issue, with 36% of children under five years being chronically stunted, nearly 60% of adult women (aged 15–49) suffering from zinc deficiency, and more than 75% of children under five being deficient in vitamin A.

The fisheries sector in Bangladesh is undergoing a transition, as it is globally, with declines in capture fisheries and rapid growth in aquaculture. Figure 2 shows production volumes from aquaculture in orange, and capture fisheries

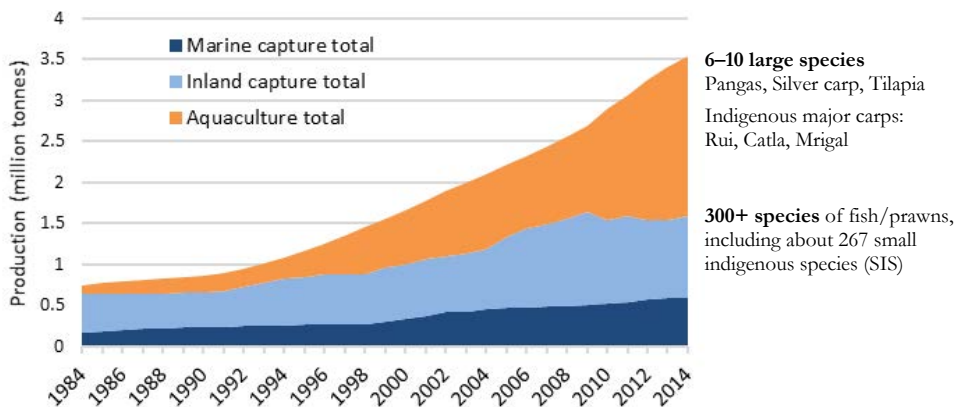


Figure 2. Capture fisheries and aquaculture production in Bangladesh over time (Dept of Fisheries: Fisheries statistical year books 1993–2015).

in blue, from the 1980s until now. There is clearly a stagnating supply from capture fisheries over the last ten years or so, and continuing rapid growth in aquaculture. The decline in capture fisheries has been driven by a number of factors, including: overfishing related to increasing demand; industrial pollution; urban encroachment; expansion of transport infrastructure; and, most significant, changes in water and land management. Floodplains have been mechanically drained for the purposes of agriculture, and floodbanks and enclosures have been constructed for the purposes of aquaculture. These structures prevent fish migration and interrupt their breeding cycles, and that has led to loss of both biomass and biodiversity.



Figure 3. Bangladesh is one of the world’s largest producers of aquaculture products.

A large focus of government and donor policies and programs has been on aquaculture (Figure 3). There have been significant investments in research and technology; a proliferation of hatcheries and fish traders; investment in a large aquacultural extension network; and significant private sector investment. These factors combined have led to Bangladesh becoming the world’s fifth largest producer of aquaculture products.

Not surprisingly these changes in availability are reflected in diets. In Figure 4, the left-hand graph shows a clear decline in consumption of fish from capture fisheries, and the right-hand graph shows a large increase in consumption of species from aquaculture.

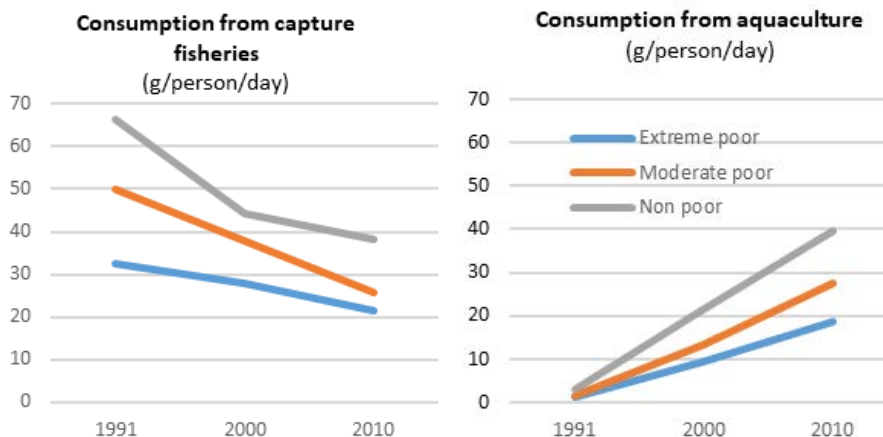


Figure 4. Shifts in fish consumption over time (Bogard *et al.* 2017).

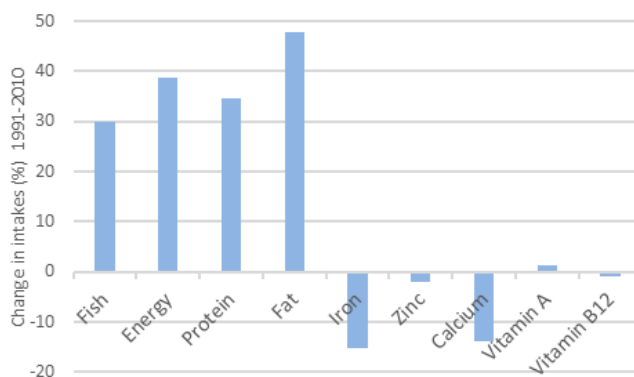


Figure 5. Change in nutrient intakes from fish, 1991–2010 (Bogard *et al.* 2017).

Does it matter?

To explore the impact of this change we analysed the nutritional value of 55 fish species from both aquaculture and capture fisheries, and we found that all species had a very similar content of protein but there was huge variability in micronutrient content. In general the species from capture fisheries were much more nutritious than those species which were being farmed.

This finding prompted the question: Has increased availability of farmed fish offset the decline in consumption from capture fisheries in terms of nutritional quality? To answer that question we matched nationally representative fish consumption data to the fish nutrient composition data to look at nutrient intakes from fish in the early 1990s compared to 2010. We found that there was an average increase in fish consumption by around 30%, and similar increases in energy, protein and fat from fish. However, intakes of micronutrients from fish showed either no change or even some decreases, despite that increase in quantity being consumed (Figure 5). These micronutrients are precisely those for which we have seen pervasive deficiencies across the population. This tells us that more is not better and, in this case, attempts to improve food security have had a negative impact on nutrition security. Aquaculture has had a vital role in maintaining availability and affordability of fish, and will continue to do so. However, the findings emphasise the need to move beyond measures of quantity in production systems, to also consider nutritional quality.

My colleague Shamia Chowdhury now describes how we are working towards bringing a nutrition-sensitive approach into fisheries in Bangladesh.

Nutrition-sensitive fish agri-food systems: various approaches

Dr Shamia Chowdhury: The nutrition-sensitive fish agri-food system is a combination of many approaches. One approach is the polyculture of diverse large and small fish species. Another approach is enhancement of large and small fish-stocking in wetland waterbodies.

Small species in polyculture include the mola fish (*Amblypharyngodon mola*). Mola is a small indigenous species which is very common in Bangladesh and is



Figure 6. Women in Bangladesh working in pond dykes; preparing vegetables for meals; and beside a fish-farming pond. *Images: WorldFish.*

naturally rich in vitamin A, calcium, iron and zinc. The large fish are carp species. The mix of small and large fish increases household consumption, and supports income generation.

From their ponds, householders can make frequent partial harvests of small amounts of small fish for family meals, which is especially beneficial for women and young children. Meanwhile, sale of large carp yields household income.

In another approach, households are encouraged to integrate micronutrient-rich vegetable production into their household routine, with a special focus on the orange sweet potato (rich in vitamin A) and other seasonal local vegetables rich in essential micronutrients. In Bangladesh vitamin A deficiency is very prevalent. By growing vegetables in their homestead gardens or on the dykes around their household ponds stocked with fish, families can add the small mola fish and the orange sweet potato to their diets, providing both iron and vitamin A (Figure 6).

Fishing technique

Women harvest the small fish using a mola gill net (Figure 7), which was designed by WorldFish. The net catches the minimal requirement for the family meal.

Women are able to catch the fish by themselves. In our country they are usually dependent on the men for the daily harvest of fish. Because of social customs, women cannot go outside the household to do the harvesting, and also they cannot enter themselves into the waterbodies. With this net they do not need to enter themselves into the pond because they can harvest the mola fish from the pond-side. This simple technology is now being adapted for use in other countries where WorldFish operates.



Figure 7. Women using the mola gill net. *Images: WorldFish.*

The women can also make the gill nets by themselves, either for their own use or to sell at the market to earn a small income.

Transforming gender norms

In transforming gender norms, we focus on household approaches: not only women but also men, mothers-in-law and others. Previously it was men who were responsible for buying or providing the family food, and mother-in-law was in charge of the kitchen and food distribution among the members of the household. Men's work was the main way the family could generate income.

Women and men easily understand the value of sharing the workload. By sharing the food-providing role and earning some income, women are gaining more influence in household decision-making processes.

Supportive communication materials

To increase the health of women, children and other family members, and to transform knowledge into practice, we have prepared a range of communication materials to encourage change in social behaviour, including information about the value of small fish and vegetables in the diets of women and young children. Our publications include training manuals, audio visual materials, and food cards, for example. Women in the communities promote the system for its support for production and consumption. We also work with government staff and NGO stakeholders in the health and the nutrition sectors, sharing our messages about 'Essential Nutrition Actions' and 'Essential Hygiene Actions'.

Lessons

During implementing this agri-food system we learned several lessons which are helping us continue to extend the system in Bangladesh and in other countries where WorldFish operates, and to scale it up.

- We have found it is very important to gain the support of the community and all family members. Without that support we do not see the positive changes taking place.
- The women taking part and as promoters are motivated by the respect they receive from their family and the community.
- Most important, we found that neighbours and other members of the community, whom we had not yet contacted, are also adopting pond aquaculture and growing orange sweet potatoes.
- Fish polyculture is increasing small-fish production and diversity. Polyculture increases total fish production by 3.5 times in household ponds, and doubles production in the larger waterbodies. More dried small fish are also being produced from the waterbodies.
- Women and young children older than 6 months are eating more diverse diets including fish and vegetables, more often.
- Household incomes are increasing, through the sale of surplus fish and vegetables at the market. The household can then use the income to improve their lives, including their health, education, and other facilities.

- By bringing in income, the women gain power to share the decision-making which gives them empowerment.

Key messages

Where nutrition is not actively considered from the start, fisheries interventions can have unintended negative consequences. Therefore it is essential when planning interventions to think through the potential impacts on diet and nutrition.

Also, working together across all disciplines is the only way to make sound progress on achieving the Sustainable Development Goals, and so we invite everyone who is working in agriculture to invite nutritionists to their table for research planning and decision-making.

References

- Bogard J.R. *et al.* 2016. Non-farmed fish contribute to greater micronutrient intakes than farmed fish: results from an intra-household survey in rural Bangladesh. *Public Health Nutrition* **2016**:1–10. <https://doi.org/10.1017/S1368980016002615>
- Bogard J.R. *et al.* 2017. Higher fish but lower micronutrient intakes: Temporal changes in fish consumption from capture fisheries and aquaculture in Bangladesh. *PLoS ONE* **12(4)**:e0175098. <https://doi.org/10.1371/journal.pone.0175098>

Jessica, a former Crawford Fund conference scholar, is an Accredited Practising Dietitian (APD) and Nutrition Systems Scientist with CSIRO Agriculture and Food. As a dietitian and public health nutritionist, she works predominantly with ‘non-nutritionists’ on approaches to leveraging agriculture and food systems for better nutrition outcomes, particularly among vulnerable population groups including women and young children. Jessica completed her PhD at the University of Queensland where she examined the contribution of fish to nutrition and food security in Bangladesh. Previously she worked for WorldFish, a CGIAR research centre, developing approaches to integrate nutrition considerations into their work on food security related to fisheries and aquaculture.

Shamia is a Nutrition Specialist with WorldFish, one of the Consultative Group on International Agricultural Research (CGIAR) centres, that harnesses the potential of fisheries and aquaculture to reduce hunger, ensure food security and alleviate poverty. Shamia is a Dental Surgeon by background. She also has a Master of Public Health (MPH), and a Master of Science (MSc) from the Institute of Tropical Medicine (ITM) in Antwerp, Belgium, focused on Health System Management and Policy. Working towards improvements in maternal and child health has become her professional forte as well as a personal area of interest. Being inspired to serve the underprivileged, she has shifted her profession from clinical practice to the development sector. Her last eight years of professional experience have provided her the opportunity to work with several respected international non-government organisations in Bangladesh, particularly in relation to health and nutrition.