ISSN PRINT 2319 1775 Online 2320 7876
 UGC CARE Listed (Group -I) Journal Volume 11, Iss 06, 2022

CAPACITY BUILDING FOR SUSTAINABLE AQUACULTURE AND FISHERIES DEVELOPMENT IN INDIA

Lairenmayum Surajkumar Singh
Assistant Professor, Department of Zoology, Kha Manipur College,Manipur

ABSTRACT
The findings of a Dutch public-private capacity building initiative, known as Knowledge to Knowledge, or K2K, aimed at supporting sustainable aquaculture and fisheries development in India are presented in this study. The mission, which was carried out in February 2015, was made possible by the Department of Fisheries (DoF) in India. In order to accomplish these goals, the team visited universities, labs, training facilities, freshwater fish farms, hatcheries, feed mills, marine fisheries companies, jetties, and fish processing companies in addition to conducting a brief literature review and meeting and interviewing important stakeholders in India.

Keywords: Capacity Building, Fisheries, Aquaculture

INTRODUCTION
International trade, livelihood security, and food security for billions of people are all significantly impacted by the global fish business. Thus, a major problem is the aquaculture and fisheries sector's sustainable development. However, overfishing and other management issues are plaguing many fisheries worldwide, even though the production of catch fisheries has stabilized in recent decades. Alongside environmental and socioeconomic challenges, aquaculture is expanding quickly (FAO, 2013).

According to reports, India produced about 4 million tons of fish in total in 2010, with aquaculture accounting for an estimated 22% of that total. The most significant source of animal protein in the nation is fish. According to estimates, the average annual consumption is considerable, ranging from 21 to 40 kilograms per person (Johnstone et al., 2012). Given its location and wealth of natural resources, India boasts exceptional fisheries and significant promise for aquaculture in the future. Its fisheries and aquaculture have significant commercial potential and will support employment, GDP, and food security in the future. Sector-wide enhancements and a geographic reach outside home markets are required to support the expenditures required to realize this promise in a sustainable manner. To further the achievement of this objective in a sustainable way, one important condition is the presence of a strong knowledge infrastructure.

The findings of a public-private capacity building mission to promote sustainable aquaculture and fisheries development in India are presented in this study. The Department of Fisheries (DoF) of India assisted Solidaridad in commissioning the mission.

2. APPROACH
2.1 Introduction
The K2K mission expanded upon a previous scoping trip conducted by Solidaridad, Wageningen UR, and World Fish on aquaculture and fisheries development in India, which was funded by the European Union (EU). This mission suggested the creation of a multi-year

EU support program after analyzing the aquaculture and fisheries industry from the standpoints of sustainability and food security. Five creative ideas or approaches should be the focus of this EU program: (1) knowledge-to-know; (2) research and development; (3) an integrated supply-chain strategy; (4) public-private multi-stakeholder platforms; and (5) strategic product-market combinations (PMC).

As part of a multi-year program towards sustainable aquaculture and fisheries, a Dutch multidisciplinary team, including representatives from Wageningen University & Research, Solidaridad, and the aquaculture and fishing companies Til-Aqua, Cornelis Vrolijk BV, Primstar BV, and PEFA, was tasked with further investigating the Knowledge to Knowledge (K2K) strategy in light of the EU mission's preliminary findings. This method provided a rare chance to examine India's knowledge infrastructure from a variety of angles, offering valuable insights into the academic and practical expertise needed to support sustainable aquaculture fishery resource use and boost economic development.

2.2 Activities

To analyse the current knowledge infrastructure in the aquaculture and fisheries sector, the teamundertook the following activities:

- a brief literature review of the educational system and the aquaculture and fisheries sector in India (see References);
- meetings and interviews with key stakeholders in India;
- site visits to universities, laboratories, training centres, freshwater fish farms, hatcheries, feed mills,marine fisheries companies, jetties, and fish processing companies.

The interviews centered on the needs and circumstances of the present as well as future goals and objectives, along with the steps required to reach them. The Education Law's overhaul was also considered at the talks with stakeholders in education.

The Netherlands Council for Trade Promotion (NCH) organized a trade mission on aquaculture and fisheries from February 2-4, 2015, which was very beneficial to the K2K mission. Additional opportunities to meet fish enterprises and learn about the goals and requirements of the private sector in India were made possible by the trade trip. The Dutch and European companies that attended also provided insightful information on the prospects and difficulties of forming alliances with Indian seafood industries.

As part of the basic capacity building, team members also conducted three workshops. These workshops provide an additional chance to discuss knowledge requirements with stakeholders.

Representatives from universities, the Ministry of Education (MoE), the Ministry of Livestock, Fisheries and Rural Development (MLFRD), and World Fish attended a closing briefing meeting at the DoF where the preliminary findings were presented and confirmed. The participants prioritized their needs for the development of a sustainable and profitable aquaculture and fisheries sector throughout the conference, in addition to providing feedback on the preliminary findings. This final report incorporates their suggestions.

ISSN PRINT 2319 1775 Online 2320 7876
 UGC CARE Listed (Group -I) Journal Volume 11, Iss 06, 2022

3. Results

3.1 Introduction

The scoping mission on India's aquaculture and fisheries development potential carried out for theEU in October 2014 identified a number of concerns. These related to (a) the 'fit' between the needs ofthe private and the government sector and the content of curricula and courses offered by universitiesand vocational training centres and (b) the quality of some of the curricula (W. van der Pijl, personal communication).

These initial results are corroborated and expanded upon by the K2K mission results shown below. The K2K mission's results situate the knowledge needs from the viewpoints of the Indian private and international fish sectors in addition to the needs noted by academic and vocational training personnel. The background of the impending education system change is given particular consideration.

3.2 Stakeholder needs

An overview of the aquaculture and fisheries sector was not the K2K mission's goal; rather, it was to analyze the knowledge infrastructure for the fish industry. We cite works by Johnstone et al. (2012), Soe (2008), and LEI (2012) for the latter. This indicates that the identification of needs is the exclusive focus of this section on the needs of stakeholders in India. The Indian government, educational institutions and training facilities, Indian fishing and aquaculture firms, and Dutch businesses looking to conduct business in India are some of these stakeholders.

3.2.1 Needs of the public sector in India

India's five year policy plan for fisheries and aquaculture has the following objectives:

1. environmentally friendly shrimp and marine fisheries production;
2. increase the production of value added fish products;
3. increase the GDP contribution of the fish sector by three times in the period 2015-2020.

"What are India's future needs for a sustainable and socio-economically viable aquaculture and fisheries sector?" was the main topic of a group discussion during the K2K mission kick-off meeting at DoF. Stated differently, what is required to accomplish the goals of the existing five-year policy plan?

The debate was structured to focus on three main areas in order to ensure that it was productive: (a) the needs of the inland and marine fisheries sector; (b) the aquaculture industry; and (c) the needs of the policymakers.

Issues were mapped collectively under these three headings. The primary topics of discussion during the DoF kick-off meeting were improving fish quality, increasing market accessibility, minimizing environmental effect, and managing stocks.

Finding the information and educational needs to support the growth of the aquaculture and fisheries sectors was the next stage in defining the demands of the fish sectors and those of the policymakers. Interviews with university and vocational training personnel as well as site visits to educational facilities were conducted in order to achieve this goal.

ISSN PRINT 2319 1775 Online 2320 7876
 UGC CARE Listed (Group -I) Journal Volume 11, Iss 06, 2022

During the interviews and site visits, university professors and staff identified a number of actions theydeem necessary for capacity building for aquaculture and fisheries education in India:

- training for curriculum and course design to revise the curriculum and syllabus;
- training in research methodology and collaborative research;
- enhance capacity building of staff from universities and DoF;
- start a programme for an MSc degree in Aquaculture;
- start a programme for an MSC degree in Fisheries Science;
- establish a Faculty of Fishery Science in selected universities;
- establish a Vocational Training School and a Marine Fishery Institute.

Staff from the Fisheries Training Centre identified the following needs:

- improve training of field staff and fisheries officers in terms of theory and practice;
- improve fisheries statistics (accessibility and analytical capacity);
- increase the number and intensity of activities of fishery officers;
- increase in number of field extension staff;
- strengthen cooperation with fishing companies and jetties;
- develop a close cooperation with universities;
- build capacity through joint project with companies and universities;
- establish a Marine Research Centre in analogy with the soon to be opened Freshwater ResearchCentre;
- development of a skills framework meeting the criteria of India's National Skill Standard Authorities;
- harmonisation of competency levels of educational system with international standards.

At the closing briefing meeting, the team provided a table showing the needs and issues identified during the kick off meeting and those that emerged during the site visits and interviews. The participants were asked to discuss in small groups to (1) identify any additional needs and issues that were not listed and (2) make a ranking of priorities.

The participants ranked quality, market accessibility, stock management, minimizing environmental effect, co-management, and conservation management as the most critical requirements for both marine and inland capture fisheries. None of these, though, was obviously given top importance. Growing high-value species was obviously the top goal for aquaculture, with market access and the promotion of native species coming in second and third, respectively.

The ecosystem-based approach, departmental collaboration on practical laws, and a policy centered on sustainability rather than production were among the requirements for policymakers identified in the ranking exercise. There was no explicit ranking of the se's priorities. This was not the case when identifying and prioritizing knowledge needs; instead, curriculum change emerged as the top priority, followed by international cooperation and the creation of a Faculty of Fisheries Sciences.

ISSN PRINT 2319 1775 Online 2320 7876
 UGC CARE Listed (Group -I) Journal Volume 11, Iss 06, 2022

From the discussion, it was concluded that the following components are key for the development of avision for sustainable and economically viable fisheries and aquaculture in India.

- development of an ecosystem-based approach to aquaculture and fisheries management;
- developing an effective fisheries (co-) management system;
- increasing international market access by producing good quality, high value species;
- increase cooperation between government departments;
- increase cooperation between public and private sector.

3.2.2 Needs of private sector in India

During the trade mission and the K2K mission, the team visited a number of private companies. Basedon the visits and discussions, an analysis was made of the needs of the India private sector in support of its economic development.

Marine fishing companies

Production of seafood is for local consumption but also for export. At the moment, China and Singaporeare important markets and sales are in bulk and at relative low prices.

The fishing companies and jetties identified the following needs:

- EU and US export approval;
- improved market export prices;
- management of the fisheries to ensure stock reproduction;
- improvement of at-sea control and enforcement system

Aquaculture (fresh water) sector

Fish diseases (parasites; Streptococcus) during the dry season, water scarcity and quality (turbidity, oxygen levels, algal blooms) during the dry season, the introduction of high-value species and the promotion of indigenous species, post-harvesting technologies, market access to the EU and US (including regulatory compliance), and climate change adaptation are the main obstacles facing small farmers and vertically integrated farms. These obstacles typically indicate suboptimal output, which can significantly boost aquaculture profitability.

With an emphasis on tilapia, the fish farmers who were interviewed expressed a strong desire to boost exports to the US and the EU.

In large to extremely large ponds, Indian freshwater fish farmers have extensive expertise with integrated aquaculture systems. For the export market, they attempted to raise tilapia to plate size in 2007. These efforts were unsuccessful. The primary causes cited were: (1) inbreeding all Thai male tilapia since only one line was used for both males and females, and (2) price rivalry from Chinese tilapia farmers who received government subsidies.

It is clear to fish farmers that monoculture of tilapia needs a different approach to fish ponds and fishstock management. Knowledge needs identified were:

- aquatic ecology/limnology;

ISSN PRINT 2319 1775 Online 2320 7876
 UGC CARE Listed (Group -I) Journal Volume 11, Iss 06, 2022

- water management: quantity and quality;
- hatchery and nursery management;
- recirculation technology;
- broodstock management;
- stocking strategies;
- tilapia ethology;
- tilapia feeds;
- disease prevention and recognition;
- hygiene.

India processors

The US and EU have authorized and regulated the fish and shrimp processors that were visited during the mission. The creation of an export market, which requires a consistent supply of larger fish, was the primary demand that was found. Given that there is already a market for them, the processors viewed pangasius and tilapia as the primary opportunistic species.

3.2.3 Needs of Dutch companies

During the trade mission and the K2K mission, Dutch companies who are interested in doing business in India found that there are a lot of opportunities for export of fresh water and marine fish products from India. The European market can be interesting for the India fishing industry and trade companies. To meet the requirements for the European markets necessary improvements must be made.

For the fresh water aquaculture, these include:

- use of two lines within YY-technology for the production of tilapia (see Box 1);
- ensure a constant supply of good quality tilapia;
- improve pond management to tackle disease issues and fish mortality;
- seek internationally acknowledged certification of responsible farming practices;
- develop aquaculture around a green and sustainable image.

For the marine fisheries, the following improvements are considered necessary by (potentially future)Dutch trade partners:

- on board quality improvements: storage cooling / freezing on board;
- fishing gear improvements aimed at reducing by-catches of small shrimp and fish and other marineorganisms;
- improve labour conditions on board;
- electronic landings registration system;
- introduction of an effective fishery management system that ensures the long term sustainability ofthe fish stocks.

In addition to improvements in the aquaculture and fisheries sectors, the Dutch companies also identifieda number of needs related to the improvements of competencies and skills of India employees involved in setting up and maintaining trade connections. These include:

- a high level of spoken English proficiency;
- strong presentation skills;
- good knowledge of the international market demands for fish products.

3.3 Practical knowledge for a sustainable sector

One of the main goals of the Indian government and commercial sector is to establish a robust export market to the United States and the European Union. All of the businesses we visited stated that gaining EU clearance was one of their goals. This also applies to the DoF and the India Fisheries Federation. Authorities in India should understand that securing approval from the EU or the USA by itself does not ensure that an export program would be successful.

First, consumers are becoming more conscious of the detrimental effects that fisheries and aquaculture have on the environment in the US, Australia, and the EU, as well as in South East Asian nations like Japan (MSC, 2014). In these areas, retailers typically ask their suppliers to provide "proof of sustainability." As a result, seafood items that are certified or labeled have significantly increased. Only fish items bearing the Aquaculture Stewardship Council (ASC) or Marine Stewardship Council (MSC) badge are allowed on the shelves of several major international retailers, according to their stringent private policy. Therefore, it is to be expected that buyers will inquire about the environmental state of production when India aims to export aquaculture goods from capture fisheries. The same is to be expected for social issues, such as labour conditions on farms or on fishing vessels because socially responsible production (Fair Trade) are nowadays part of the mind-set of fish buyers as well.

Second, tilapia (and possibly pangasius) are the primary focus of freshwater aquaculture development. It is crucial to remember that the global markets for these species are already oversaturated, making competition challenging. A Cost Leadership Strategy could be used to identify a specialized market. Producing a product at the lowest feasible cost is the goal of a cost leadership strategy (Porter, 1985). When it comes to tilapia in India, the goal would be to produce them more cheaply than other tilapia from Southeast Asia. Alternatively, by identifying niche markets, a Differentiation Strategy (Porter, 1985) could be used to raise the product's value.

Given that India is now one of Southeast Asia's smaller tilapia producers, its fish are unlikely to be able to compete with rivals like Thailand, Indonesia, China (whose output is heavily subsidized), and the Philippines. Given the current state of the US and EU markets, a differentiation strategy is therefore probably the better choice. It is pertinent to mention in this regard that additional US states may outlaw the use of hormones for sex reversal. The usage of antibiotics and its possible effects on human health are receiving more and more scrutiny in the EU. For India, this could be an intriguing niche.

International markets exist for tilapia produced in a more environmentally friendly and sustainable way. A growing number of buyers are prepared to pay more for a product that is of greater quality and produced responsibly. An essential component of this can be certification or labeling by a globally recognized program like the Aquaculture Stewardship Council (ASC).

Given India's "virgin image" as a recently developed nation, the nation can yet construct its own "green and sustainable" image from the ground up. India may be in a great competitive position to export to the US and EU with such a reputation. The establishment of such a green image is highly compatible with the needs that Indian public stakeholders and private stakeholders from India and the Netherlands have identified.

The enthusiasm of the India stakeholders displayed to meet thischallenge in combination with (a) the opportunities provided to the universities by the national educationreform policy, (b) the interest in India by programmes from amongst other the EU, USA and Australia, (c) the ongoing work of World Fish MYFISH project, (d) the fast development of internet accessin the country and (e) the interest of the Dutch private sector to work with India partners are strong drivers to develop the necessary capacity and knowledge infrastructure for the development of a sustainable fish sector.

During the K2K mission, there was an initial chance to develop capability around these themes through three fundamental workshops. The first workshop addressed governance for sustainable fisheries; the second focused on the Netherlands' experiences with innovations in and exchange of ideas regarding more sustainable fishing gear; and the third addressed tilapia hatchery management, quality control, and fish disease prevention. The fact that so many people attended the sessions shows how eager and willing Indian governmental and commercial stakeholders are to collaborate toward a competitive and sustainable fish industry.

3.4 Future capacity building

During the 2K2 mission, it became clear that there was substantial interest from university professors and representatives from the MHE to develop more competency based curricula. The Netherlands Fellowship Programme (NFP) for Tailor-Made-Training (TMT) Programme could offer opportunities for thefuture. This programme managed by NUFFIC on behalf of the Netherlands government provides an opportunity to develop the necessary capacity and knowledge infrastructure at the universities. A tailor- made training course is designed to meet specific needs of a requesting organisation. The TMT focusses on:

- market based professional competency profile descriptions and learning goal formulation, including a
- market needs assessment and assistance of the experts for the final common report with profiledescriptions;
- development of students' competency oriented curricula and course descriptions, including a feed-back workshop at each of maximum seven universities.

In addition, setting up concrete cooperative projects involving universities, companies and the authoritiescan provide a concrete platform for hands on capacity building. During an earlier EU scoping mission and in the aftermath of the 2015 Dutch trade mission preceding the 2K2 mission, a number of opportunities for potential public-private partnership pilot were identified. These include:

- the development of two sustainable and inclusive business models for freshwater and marine aquaculture supply chains (tilapia and *P. monodon* shrimp), linking smallholder

ISSN PRINT 2319 1775 Online 2320 7876
 UGC CARE Listed (Group -I) Journal Volume 11, Iss 06, 2022

farmers to thebusiness cases of larger companies, which will act as the drivers for change;
- the development of one integrated pilot for marine shrimp fisheries focussing on enhancing sustainability and quality to enter the export market.

4. Conclusions

There is a mismatch between supply and demand on the labor market as a result of the way Indian universities are now set up. The knowledge infrastructure is less focused on meeting labor market demands and more focused on supply. This indicates that pupils are not always given the instruction they need to acquire the knowledge and abilities needed for India's economy to grow (sustainableally). Currently, graduates are just not ready for their positions in government or the business sector. Universities will have more autonomy as a result of the new education law, which presents a chance to close this disparity.

However, it appears that the university administration has no plans to make significant changes to its curricula. This stands in contrast to the needs that the business sector and government stakeholders have outlined. They contend that a more ecosystem-based approach to aquaculture and fisheries, as well as a functional fisheries governance system (including control and enforcement), are essential given that natural resources form the foundation of a sustainable economy and constitute a safe portion of the Indian populace's staple diet. Furthermore, quality enhancements are required to expand the intended export market for fish.

Most people believe that the best course of action is to collaborate with the business sector and build strong ties, or as one respondent put it, "from education to practice and from practice to education." In order to meet these needs, policymakers, the private sector, and the majority of the professors we spoke with during our visit prioritize curriculum development. As a result, the demands of "the world of work" do not align with the opinions of the university's upper management about curriculum modifications.

The most urgent knowledge and capacity needs identified by public and private stakeholders include:
- developing fisheries, aquaculture, seafood processing masters specialisations that connect tobusiness and societal needs;
- gaining experience in the field with businesses, governments and stakeholders;
- improving knowledge and understanding of research methods;
- improving students' oral proficiency in English;
- introducing skills and competency based education;
- strengthening pedagogic training for lecturers and professors;
- aligning with the international education system, its levels and standards.

The aforementioned requirements must to be positioned within the framework of a shared vision for the growth of India's aquaculture and fisheries industries in a sustainable and profitable manner. The five-year plan, which ends in 2020, seems to be written in extremely basic terms. Group discussions at the K2K visit's opening and closing meetings were a first step toward the development of such a vision.

The participants identified the following components to be priority in such a vision:

- development of an ecosystem-based approach to aquaculture and fisheries management;
- developing an effective fisheries (co-) management system;
- increasing international market access by producing good quality, high value species;
- increase cooperation between government departments;
- increase cooperation between public and private sector.

Universities will have more autonomy as a result of the new education law, which presents a chance to close this disparity. Nonetheless, it appears that the university administration is determined to significantly alter their programs. This stands in contrast to the needs that the business sector and government stakeholders have outlined.

A more ecosystem-based approach to aquaculture and fisheries, along with a functional fisheries governance framework that includes control and enforcement, are seen by stakeholders as essential. This is due to the fact that natural resources are a secure component of the Indian people's staple food and the cornerstone of a sustainable economy. Furthermore, quality enhancements are required to expand the intended export market for fish.

Most people believe that the best course of action is to collaborate with the business sector and build strong ties, or as one respondent put it, "from education to practice and from practice to education." In order to meet these needs, policymakers, the private sector, and the majority of the professors we spoke with during our visit prioritize curriculum development. As a result, the demands of "the world of work" do not align with the opinions of the university's upper management about curriculum modifications. This disparity must be addressed for a shift to a more demand-oriented information infrastructure capable of fostering the growth of a sustainable fish industry to be successful.

The goal of creating a robust export market to the United States and the European Union, which is a top priority for both the Indian government and its private sector, should be weighed against the desire to create a more ecosystem-based approach to aquaculture and fisheries as well as a functional fisheries governance system (including control and enforcement). The Indian government and private sector should be aware that future consumers will have higher standards for hygiene and quality than what is legally required, given the ongoing global trends regarding socially and environmentally conscious seafood products.

References

- British Council (2013), empowering higher education - A Vision for India's Universities. Report of thesecond Policy Dialogue. Naypyitaw 29-30 June 2013.
- LEI (2012), India seafood exports. Quick scan of the EU market potential. Compiled for CBI by LEIWageningen UR. The Hague.
- FAO (2013), State of the World Fisheries and Aquaculture. Rome: FAO.
- Johnstone, G, R. Puskur, J. Pant, M. Phillips, R. Gregory, E. Baran, Y. Kura, M.S. Khin, C. Grunbuhel, S.Nilar, W. Nyuant and A.Y, Saw R, (2012). Ayeyarwady Delta Scoping. World Fish MYFISH.

ISSN PRINT 2319 1775 Online 2320 7876
 UGC CARE Listed (Group -I) Journal Volume 11, Iss 06, 2022

- Lwin, T. (2013). Comprehensive Education Sector Review - Higher Education in India. Yangon: CESR. Marine Stewardship Council (2014). New research shows increasing appetite for sustainable seafood.
- MHE DoE (2015), PowerPoint presentation on India's education system. Yangon: Ministry of HigherEducation.
- Porter, M. (1985), Competitive Advantage: Creating and Sustaining Superior Performance. New York:Free Press.
- Soe, K.M. (2008), Trends of development of India fisheries: with reference to Japanese experiences.
- V.R.F. Series 433. Japan: Institute for Developing Economics.
- Thein, D. O., A.A Myint, T.M. Oo (2014), Comprehensive Education Sector Review Phase (2) Report(Draft) Consultation Meeting, Higher Education Sector. Yangon: CESR.