

# MSc Aquatic Resource Development

Bangladesh experiences various climate related natural disasters such as floods, droughts and cyclones, but three students on the MSc ARD programme have investigated options that will enable adaptation thus ensuring continued food production. This supervised research adds further value to the work they are doing in their everyday jobs.

## Aquaculture in flood prone areas

Utpal Kumar Dutta, an employee of Practical Action Bangladesh, worked on aquaculture in the flood-prone Gaibanda area of northwest Bangladesh. His research focused mainly on risk management of aquaculture to secure livelihoods of the poor in flood affected areas. Bangladesh experiences over-flow of water causing floods during the monsoon season. Analysis of past flooding suggests that 26% of Bangladesh is subject to annual flooding and an additional 42% is at risk of floods with varied intensity. Each year a considerable number of ponds are inundated and consequently stocked fish are lost and predators and undesirable fish enter into the pond. It is therefore necessary to increase the height of pond dykes using mud, net or bamboo fencing to above the flood level. In addition, some changes have to be made in stocking and harvesting schedules. This project suggests that the introduction of low-input post-flood aquaculture in Bangladesh is feasible for the rural poor. The study also reveals that relatively well off farmers took advantage of the new technology, indicating the need for institutional support for poor farmers to benefit from aquaculture in flood-prone ecosystems.

## Dead-river Fish Culture



Increased temperature due to climate change is resulting in a higher evaporation rate and a decrease in soil moisture with surface water areas shrinking in the dry season. As a result, a number of 'dead rivers' have been created

in the char areas. Md Rafiqul Islam Khan worked on community-based dead-river fish culture in the char areas of the Jamuna River in Bogra district. He studied a group of fishers who were involved in dead-river fish culture during the dry season between November and March. During the rest of the year, group members were involved in fishing inundated rivers, agriculture in char lands and livestock rearing. In general, Indian major carps and exotic carps were cultured in these dead-rivers with no need for feed or fertilizer inputs. The harvested fish were sold to local markets through intermediaries. In addition to savings for next year's fish stocking, income from fish production was equally distributed among the group members. As fish farming in dead-rivers is an innovative idea, more char dwellers are interested in dead-river fish culture to supplement their income.

## Peri-urban Aquaculture



A significant number of lower income households are associated with peri-urban aquaculture in and around Savar Upazila, a growing suburb of around 378,000 inhabitants which is located 20 km from Bangladesh capital Dhaka. The increasing population and rapid urbanisation is producing a considerable number of ponds, tanks, low-lying lands and abundant brick fields which have been utilized for fish farming. Peri-urban aquaculture is now practiced to provide food, income and employment opportunities for many people in Savar. The study, focusing on the present status of peri-urban aquaculture activities in the Savar area including fish marketing systems, was carried out by Md Fazlul Hoque through Participatory Community Appraisal. Increasing demands for fish in Dhaka markets has encouraged the expansion of peri-urban aquaculture, while constraints to development of peri-urban aquaculture include lack of community awareness, multiple ownership of water

bodies, rapid urbanisation, flood, drought, poor water quality, environmental and public health concerns.

There is concern that climate change could increase food insecurity. With this in view, flood-prone aquaculture, dead-river fish culture and peri-urban aquaculture are new dimensions of fish production in Bangladesh. From a climate change point of view, it is important to realise that aquaculture offers opportunities to increase food production that may also help to increase income, food security, and livelihoods of millions of poor.

**Here is a small selection of other MSc ARD projects of relevance to development in Bangladesh**

## Does rice-fish really reduce pesticide use?

The use of pesticides in crop production spread rapidly worldwide after World War II. In Bangladesh, the level of pesticide use was almost negligible until the 1970s, however, it has increased dramatically over recent decades. For instance, the use of pesticides increased from 2200 metric tons in 1980 to 6500 metric tons in 1994 with escalating areas of land under high yielding rice varieties. There is a widespread claim among scientists and practitioners that increasing pesticide use amplifies resistance to pesticides and harms the environment and human health. In order to reduce or avoid pesticide use, several integrated pest management (IPM) practices were developed and promoted. One such IPM tool is the production of fingerlings or foodfish in ricefields. How such a strategy affected farmer behaviour within a community was not well understood. Aiming to understand this, one of the MSc - ARD project year students Mr. Nitya Ranjan Biswas, District Fisheries Officer, Dinajpur, Bangladesh, carried out his investigation at the community level in Northwest Bangladesh.





According to his research findings, farmers producing fish in their rice-fields at the community level completely rejected the use of pesticides for rice. This type of ricefish farmer is increasing every year through farmer-to-farmer knowledge dissemination without further external supports. Ricefish farmers have also reduced pesticide use in their rice-only plots as a consequence of their increased level of understanding on surrounding pesticide use. In ricefish adopting communities, farmers not producing fish in ricefields have significantly reduced pesticide use in their rice-plots compared to the farmers in non-ricefish communities, seeing behavioural changes of neighbouring ricefish farmers. This reduction in pesticide use could be explained as a trickle down benefit from ricefish farmers to non-ricefish farmers. The level of pesticide use in ricefish communities was found to be significantly lower than in the communities where ricefish was not promoted. Farmers in ricefish communities tended to be poorer than farmers in non-ricefish communities. This confirmed that adoption of ricefish was beneficial to the poor as it led the poorer farmers to produce fish in their ricefields, to reduce pesticide use and to save money.

Obviously this study shows very valuable findings in terms of changing farmer behaviour towards the reduction of pesticide use in their ricefields. This also suggests the need to promote ricefish in other parts of Bangladesh with the aim of reducing pesticide use and increasing fish production.

### **Floodplain encroachment by agricultural activities and its impact on fishing communities**

Bangladesh is a densely populated deltaic country criss-crossed by 250+ rivers and approximately four million hectares of open water consisting of rivers, canals, haors, baors, beels and floodplains. Of these, beels are the natural feeding and breeding grounds for self recruiting (SRS) small indigenous species (SIS) and are rich in aquatic flora and fauna maintaining aquatic biodiversity. These beels are the last remaining areas of common property in Bangladesh providing much needed food and a source of income for the millions of fishermen and families focused around them. However, agricultural activities such as the production of rice and vegetables converting marginal zones into pasture

have seriously encroached on these systems reducing them in size, slowly disrupting the livelihoods of the poor fishermen who are dependent upon the floodplains. The ARD project of Touhid Rahman set out to assess the impact of agricultural encroachment on the livelihoods of fishermen through PRA techniques and remote sensing image interpretation using GIS tools in three selected beels in Naogaon Sadar upazila, Naogaon district, Bangladesh. Both quantitative and qualitative data were used in the study including Landsat TM images and primary data collected from the field which was supplemented with secondary data from a range of sources. Primary data were collected through livelihood analysis of fishermen and non-fishermen living around the beels, personal interviews and focus group discussion (FGD) methods which were used to cross check the gathered data with the key informants.

GIS imaging, FGD and PRA data analysis confirm that water area, water depth, fish catches and aquatic weed cover of the beels have all reduced dramatically over the last 20+ years. Over the same time period, rice and vegetable production has increased, while large mesh cotton nets have been replaced by lower mesh size monofilament nets. Thirty species of SIS and SRS were available in all three beels in 1981 but by 2006 the number had dropped to 6 in Digholi beel, 8 in Jamuni Fatapur beel and 9 in Pakuria Patiladaho beel. The livelihood study revealed that the number of people having primary and secondary education and low cost straw made houses are higher in non-fishermen communities than that in fishermen communities. In addition, the annual income of non-fishermen communities is higher than the fishermen communities in all three beels. The study confirms that all three beels within Naogaon district have been heavily encroached upon by agricultural activities over the period 1981-2006, impacting on the aquatic biodiversity of the beels and the livelihoods of the fishermen based around them.

### **Formalin use in Dhaka fish markets**

Recently, the use of formalin to preserve fish in the country's fish markets has raised concern, genuinely so, because Bangalee's ever lasting fondness for fish is well known. The purported widespread use of formalin in fish has also been extensively reported in the country's mass media. The consumption of formalin-treated fishes could expose people to various health hazards including cancer, skin diseases and gastro-intestinal disorders. Although there are no exact statistics available, a newspaper report estimated that every day some 150 tonnes of fish are sold in Dhaka city's 40 kitchen markets and about half a dozen wholesale markets. A great proportion of the fish sold in the city are imported from India and Myanmar and there has been speculation that this imported fish

might be the source of formalin. Keeping all this in mind a research project has been carried out by Meherunnessa, one of the ARD students with the following objectives: i) to explore the nature and extent of use of formalin on fish within selected fish markets of Dhaka city; ii) to determine the source points of formalin addition to fish; and, iii) to understand consumer perception of formalin preserved fish. She selected six markets within Dhaka city - two poor peoples' markets, two medium markets and two well-off markets for the collection of fish. A locally developed detection kit was used to confirm the presence of formalin in sampled fish and questionnaires and interviews were conducted with traders and consumers.

Meherunnessa's findings revealed that formalin was present in fish sampled at all three categories of markets. Of the 400 fishes that were tested, 192 samples were found to be formalin positive. Though formalin was present in both native and imported fish, the percentage of positive samples was much higher in native fish than in the fish originating from outside Bangladesh. The presence of formalin was also found to be higher in the fish collected from the poor peoples' markets than in those taken from the well-off markets. Meherunnessa also observed that more formalin positive samples were found in the fish sampled in the evening than those collected early in the morning. Fish sellers were also reported to suffer from skin and inhalation problems which they believed was due to handling formalin. Consumers of fish bought at the poor and medium markets were not aware that the fish they consumed may have been exposed to formalin. The consumers purchasing their fish at rich markets, however, were well aware that formalin is occasionally used in certain markets. Preliminary findings suggest that if formalin is used, then it is being used at the various wholesale and retail markets in Dhaka city. It has been suggested that when used, formalin is injected into the stomach and head of large fish and the fish is then dipped several times into a formalin solution before selling. Interviews with fish traders would suggest that a shortage of freezing facilities and ice factories and the time-consuming transportation of fish, forces them to resort to such dangerous and illegal practices.

The MSc programme in Aquatic Resource Development is operated in Bangladesh by Stirling in partnership with Bangladesh Agricultural University. It is aimed at people who are in work, but wish to further their qualifications. The course lasts three years with a mix of modules and projects designed to add value to on-going employment activities across the wide range of student interests.

**More information** can be obtained from [www.aqua.stir.ac.uk/training/tpg](http://www.aqua.stir.ac.uk/training/tpg), by phoning 091 54927 in Bangladesh or 01786 467878 in the UK, or by e-mailing [ard@stir.ac.uk](mailto:ard@stir.ac.uk)