

## Mission Note Bangladesh, March 15-31, 2009<sup>1</sup>

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### 1. Mission justification and background

**The Government of Bangladesh has requested the World Bank to provide further assistance to the livestock and dairy sectors.**

During a mission of the Sector Manager of Agriculture and Rural Development (ARD) of the South Asia Region of the World Bank to Bangladesh in November 2008, the Secretary of the Ministry of Livestock and Fisheries (MOFL) of the former Caretaker Government of Bangladesh (BD) requested the Sector Manager for assistance to the development of the dairy and fisheries subsectors to support the livelihoods of the rural people and contribute to the economic growth of the country. The Secretary of the MOFL also reminded the Bank of its proposal for an investment request for dairy development to the Bank sent in 2007. In response, the Bank agreed to carry out a technical mission to review the current state of the livestock sector (with special focus on the dairy sub-sector) and the fisheries sector, particularly inland fishery production (including freshwater capture and freshwater aquaculture). The mission reviewed policy, technical and administrative aspects in order to identify key bottlenecks and assess the scope for Bank-supported further development of the sectors. This request of the Government is consistent with the emphasis in the Poverty Reduction Strategy Plan (PRSP) on further development of the livestock and fisheries sectors which together account for 7 percent of total Gross Domestic Product (3 percent livestock, 4 percent fisheries) and 33 percent of agricultural GDP).

**The World Bank has reacted by fielding two scoping missions.**

A combined dairy and fisheries development scoping mission (focusing on inland fisheries) consisting of Messrs. Grant Milne (Sr. Natural Resources Management Specialist); Hans Jansen (Sr. Agriculture Economist); Nihal Fernando (Sr. Rural Development Specialist and Country Sector Coordinator for ARD); Gopalakrishna Kurup (Consultant Dairy Development Specialist); and S. A. M. Rafiquzzaman (Sr. Irrigation Engineer), was conducted during March 15-31, 2009. The mission focused on fisheries under the team leadership of Grant Milne during March 15-21 and on dairy development under the team leadership of Hans Jansen during March 21-31, 2009. During March 15-21, Messrs. Milne, Jansen, Fernando and Rafiquzzaman engaged with the Government, donors and non-government stakeholders (including a field visit to Sirajganj district) to assess the possibilities for Bank assistance with inland fisheries development taking into account the 2006 National Fisheries Strategy and Action Plan; and an earlier Policy Note

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<sup>1</sup> This Mission Note was prepared by Grant Milne (Fisheries chapter) and Hans Jansen and Gopal Kurup (Livestock chapter) building on earlier work done by the World Bank (World Bank, February 2008, High Value Agriculture in Bangladesh: An Assessment of Agro-business Opportunities and Constraints, Bangladesh Development Series Paper No. 21) and recent work done by Nihal Fernando (January 2009, Draft Bangladesh Fisheries Development Policy Note, unpublished). Messrs. Nihal Fernando and S. A. M. Rafiquzzaman provided useful comments to this note.

on fisheries prepared by Nihal Fernando. During March 22-28, Messrs. Jansen, Kurup and Fernando engaged with the Government, donors and non-government stakeholders to assess the possibilities for Bank assistance with dairy development. The mission had the opportunity to meet with a wide range of stakeholders in the dairy field and made a three-day field visit to the Gaibandha area and Deluabari char (see Annex 2 for an agenda and detailed account of the field visit and Annex 5 for a list of people interviewed).

**The scoping missions adopted a wide perspective analyzing the policy environment in which both sectors are operating as well as their economic performance and value chains.**

While keeping focus on broader livelihood development perspective, the mission focused on aspects related to input supply, production technologies, logistic infrastructure, market structure, producer organizations, value-chain development, human capital issues, supporting services, and regulatory impediments and policy-induced distortions. Section 2 and Section 3 of the Mission Note elaborate the main findings and recommendations, which would provide basis for the formulation of strategies and action plans for further development of, and possible Bank engagement in, respectively the inland fisheries and the livestock sector.

## 2. Fisheries Subsector

### 2.1 Status of the Bangladesh fisheries sector

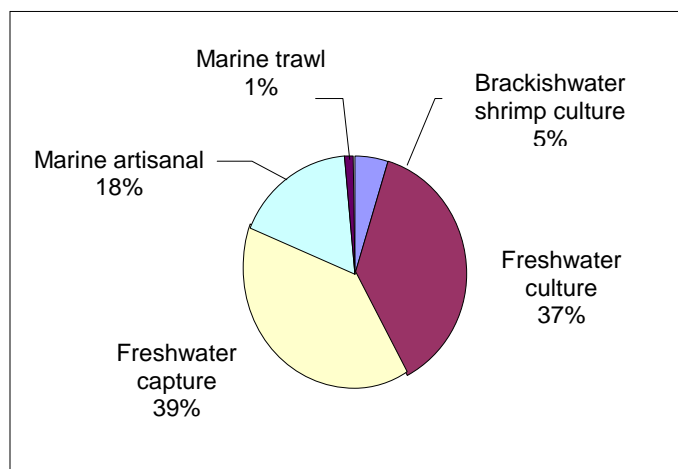
**The fisheries sector in Bangladesh is dominated by inland fishing waters.**

Bangladesh's fisheries sector consists of four sub-sectors: Inland Freshwater Capture Fisheries (or inland open fisheries); Freshwater Aquaculture (or inland closed fisheries); Brackish Water Shrimp/Prawn Culture; and Marine Fisheries. With the country's unique geographic situation at the delta of three major river systems (Ganges, Brahmaputra and Meghna), Bangladesh has one of the highest human-water ratios in the world and huge potential for inland fishing.

**More than three quarters of total fish landings in Bangladesh originate from inland waters.** In 2006-07, Bangladesh's total fish production was approximately 2.4 million

tonnes, derived from inland fisheries (1.9 million tonnes) and marine fisheries (493,000 tonnes). Bangladesh is the sixth largest aquaculture producing country in the world. Aquaculture (freshwater culture) accounts for about 37 percent of the total fish production with inland open water fisheries (freshwater capture) contributing another 39 percent. Over the period 1984-05 to 2006-07, total

Share of Bangladesh fish landings, 2006-07



fish production has grown from 774,000 tonnes to 2.4 million tonnes, or an average of 5.2 percent per annum. The fastest average annual growth (9.3 percent) is from inland culture or aquaculture fisheries<sup>2</sup>.

**Fisheries is a critical pillar of the national economic and social fabric.**

The fisheries sector, and in particular inland fishing, is crucially important to Bangladesh achieving the country's Millennium Development Goal of 50 percent reduction of poverty in 2015 because of its contribution to nutrition, exports and employment generating opportunities. Shrimp and limited frozen fish exports account for about 4.9 percent of total national export earnings, and rank third after ready-made garments and knitwear as the largest export products. Shrimp exports generate significant export incomes (US\$432 million in 2006/07). The sector employs almost 1.3 million and 12.5 million full-time and part-time fishers respectively, yet the majority of participants are poor. Also, about half of the rural poor households living in the floodplains catch fish and use other aquatic resources as a major source of livelihoods. An estimated 30 percent of women in rural and coastal areas are directly or indirectly involved in fishing. Fish products supply an estimated 60-80 percent of the country's animal protein needs, based on an annual per capita fish consumption of 14 kg/year, well below the minimum requirement of 18 kg/year.

**The 1998 National Fisheries Policy provides a reasonable foundation for sector development but has not yet been effectively implemented.**

The Government approved a new National Fisheries Policy (NFP) in 1998. The primary objectives of the NFP are to enhance production, use fisheries to address poverty, improve protein supplies, increase export earnings and sustain aquatic ecological systems. The policy includes detailed policies for: conservation, management, and exploitation of fisheries resources of the inland water bodies (inland capture fisheries); fish culture and management in inland closed water bodies (aquaculture); coastal shrimp and fish culture; exploitation, conservation and management of marine fisheries resources (marine capture); quality control, planning, monitoring and evaluation; and fisheries extension and human resources development. The policy applies to all people and agencies working within the country, related to the fisheries sector. The policy also applies to all water bodies suitable for fisheries production and their resources.

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<sup>2</sup> **Inland open water bodies**, where capture fishing is mainly carried out, comprise rivers and estuaries, *beels* (small lakes, low-lying depressions, permanent bodies of floodplain water, or bodies of water created by rains or floods that may or may not dry up in the dry season; in the wet season, *haors* or shallow lakes may be formed as smaller water bodies are joined up), Kaptai Lake (a man-made lake created for hydroelectricity) and floodlands (annually flooded, low-lying areas associated with rivers). **Inland closed water bodies**, where aquaculture (fish farming) at various intensities is carried out, include ponds, *dighis* (big ponds) and *haors* (oxbow lakes), and also some coastal waters. **Marine waters** extend over 166,000 km<sup>2</sup> (16.6 million ha) of sea area, following the 1974 declaration of a 200-nautical mile Exclusive Economic Zone (EEZ), within which Bangladesh also has the right to exploit and manage living and non-living resources.

**The 2006 Fisheries Strategy and Action Plan provides a comprehensive roadmap for sector development.**

In 2006, government drafted a comprehensive National Fisheries Strategy and Action Plan (NFSAP) through a series of detailed studies, position papers, discussions and meetings; it represents one of the most significant consultative exercises of its kind ever undertaken around the Bangladesh fisheries sector. The NFSAP is focused on core areas covering: long term planning; people's participation; coordination, collaboration and support for the sector; regulatory framework; pro-poor approaches; gender; alternative income generation sources to fishers; and environmental management. It also includes detailed strategies and action plans for eight sub-sectors: inland capture fisheries; aquaculture fisheries; aquaculture extension; planning, monitoring and evaluation; marine fishing; shrimp fisheries; quality control; and human resources development. While noting the highly consultative process used to develop the strategy, implementation to date has been fairly limited.

**The fisheries legal framework is broad and complex.**

More than 20 pieces of legislation impact on fisheries. The basic Act regulating inland fisheries is the Protection and Conservation of Fish Act (1950). The Marine Fisheries Ordinance (1983), implemented by the Marine Fisheries Rules (1983), is the basic Act regulating marine fisheries. For inland fisheries, leasing of open waters and public sector ponds is complex and often involves multiple Acts and agencies. The overall responsibility for the administration and management of government-owned land and water bodies is vested in the Ministry of Land (MoL). The MoL recently passed limited authority to the MOFL to lease various water bodies in the country as part of its pilot Community Based Fisheries Management Program (supported through bi-lateral donors), however community based management per se, has no direct legal standing.

**A wide range of government institutions are active in the fisheries sector.**

Within the government of Bangladesh, six agencies play key roles. First, the department of fisheries (DoF) in the MOFL is the designated national competent authority for fisheries policy and management; export inspection and quality assurance; monitoring, evaluation and reporting; research and development, and technical extension services. Second, and as indicated earlier, the agency with overall responsibility for the administration and management of government-owned land and water bodies is the MoL. Third, the Ministry of Commerce is responsible for export development of all products including seafood. Fourth, the Department of Environment (DoE) under the Ministry of Environment and Forests is the competent national authority to administer the Environmental Protection Act (1995), which impacts on environmental clearance for industrial enterprises and projects including aquaculture. Fifth, the management of land and water bodies is conducted through the local government system; in each of the six Administrative Divisions, a Commissioner oversees Districts with a District Commissioner as the chief administrator. Below the district level there are Thanas, which perform functions relating to the management of land. Finally, the Bangladesh Fisheries Development Corporation provides market and storage facilities to fishers and traders, as well as loan finance, primarily for shrimp production.

**Fisheries sector development is supported by several non-government agencies.**

Several other organizations outside government are involved in fisheries sector development. Examples include the Bangladesh Frozen Foods Exports Association with 80 members, including 56 processing plant owners accredited for the EU market, mainly for shrimp. The Bangladesh Marine Fisheries Association has 22 members, mainly representing industrial fishing trawlers operating in the Bay of Bengal and largely for shrimp aimed at the foreign export market. The Bangladesh Dried Fish Exporters Association represents organizations involved in the export of dried fish from coastal areas. Finally, a number of highly competent and experienced national and international NGOs currently operate in Bangladesh to support the fisheries sector, especially inland fish and shrimp production. These are generally supported by bi-lateral donor programs.

*2.2 Key issues and opportunities*

2.2.1 Inland Freshwater Capture Fisheries

**The policy of leasing inland fresh water bodies must be reformed.**

The existing leasing system of fresh water bodies to individuals for capture fisheries is problematic. The primary objective of the present leasing system has always been to maximize government revenue rather than provide improved resource access and employment opportunities to rural fishers. However, the annual revenue generated is not only insignificant (about 0.07 percent of total government revenue) but is also associated with many unresolved and prolonging legal cases, which prevent collection of the revenue on time. The lease fees can be excessive for poor people or communities to afford. A typical beel fishery of significant scale could carry a lease cost of US\$10,000 plus 15 percent value added tax (VAT), and a 3 percent income tax on the lease fee. Also, the government policy has been to increase lease fees by 10 percent each year. The system lends itself to rent-seeking behavior and high transaction costs. Since 2006, governments have agreed in principle that revisions to the leasing policy and inland capture strategy are needed to ensuring that rural poor have better access to aquatic resources. Currently, there is a 45-day moratorium on new leases while the MoL and MoLF discuss possible policy and regulatory solutions that would enable communities to take up leases with better protection from wealthy business people, elites, and corrupt officials. The longer-term aim is to develop a comprehensive water body leasing policy rather than the ad hoc lease dispensations that are tied to various donor-driven and NGO delivered programs. Alternative approaches to leasing are possible with the goal of government providing secure use rights without giving up land/water ownership, which can often become politically and emotionally charged problems.

**Community-based production and co-management needs further support.**

Experience from other countries show that sustainable inland fisheries management and protection of bio-diversity can be better carried out by organized fisher communities through collective action. One problem that must be addressed is that current fisheries legislation does not explicitly recognize community-based fisheries management. Any transfer of management of floodplain fisheries will need to occur in a phased manner

through well planned and monitored pilots, as part of a long-term program. This must also be merged with programs to build stronger local institutions and capacities, credit facilities, technology support, and market linkages.

**Programs must improve equity on beel fisheries covering private farm land.**

In many parts of the country, as floodwaters recede after the monsoons, closed beels emerge on private farm lands that can be used for commercial fish production. Typically, participating farmers pool seed capital each year to purchase fingerlings after the monsoons, pay for monitoring against illegal fishing, and invest in fishing gear maintenance/replacement as required. Often, local fishers are hired to manage the pond and harvest the fish. The final harvest is shared by the farmers and fishers based on various self-determined arrangements. One emerging issue has been how to include landless (non-fisher) people in the scheme. With the assistance of NGOs (for example, SHISUK<sup>3</sup>), more advanced models are emerging on larger beels (up to 150 ha), covering several villages. The model can be expanded to improve livelihoods through agricultural extension services, agro-forestry, and animal husbandry. In particular, the model lends itself to integration with increased rice production in the affected fields; flooding and fish management allow for more water retention in the soil and higher nutrient levels from fish production, especially nitrogen.

**The productivity of capture fisheries is fairly low.**

Wild fish yields in conventional floodplain and open river fishing can be between 150-350 kg/ha/year of fish. Beels under basic management may generate up to 450 kg/ha/year. More intensive management can produce between 1,000 kg and 3,000 kg of fish per ha/year. A major factor in low productivity of inland capture fisheries is that government-driven technology transfer and extension services to communities is poor, with field staff often lacking proper training, access to research results, equipment, and transport. There is a need to scale up new approaches being piloted for capture fishing such as cage management in open beels and rivers, closing off beels and adding a 1 meter ditch to hold water for advanced growth of fingerlings before monsoons, use of improved feedstock in closed beels, etc.

**A stocktaking is needed of inland capture fisheries water bodies.**

The government has various estimates of available freshwater bodies that can support capture fishing. Some estimates suggest 12,000 Jalmohals (public water bodies) of varying size and types of wetlands. No current inventory exists that merges administrative, physical, biological and human information on these ecological systems. There is an urgent need to consolidate and computerize leasing records, and use remote sensing and GIS to develop a modern inventory of water bodies that can help identify high-potential areas for freshwater capture fishing. This information could be updated semi-annually, before and after the monsoons.

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<sup>3</sup> Shikkha Shastha Unnayan Karzakram (SHISHUK) is supported by the WorldFish Centre in Dhaka, through DFID funding.

## 2.2.2 Freshwater Fish Aquaculture/Cultivation

### **Reforms are needed for leasing inland pond bodies for fisheries.**

As with inland capture fisheries, a number of similar issues surround leases of government owned ponds for aquaculture or cultivation fishing, particularly with avoiding elite capture and corruption. Through various bi-lateral financed programs, implemented by national NGOs with communities, leases have been arranged for varying time periods for government-owned, degraded ponds, in some cases as long as 25 years. When these leases end however, there is often major uncertainty if the lease will be renewed for the community's use or grabbed by local businessmen and elites. As with capture fisheries, it is hoped the current dialogue between the DoF and DoL will result in substantive policy and legal reform to support the transfer of strong and renewable user rights to government-owned ponds for fish production.

### **The productivity of freshwater aquaculture for fish under traditional, low-input management is much smaller than the potential.**

The current average productivity of freshwater aquaculture in Bangladesh is about 1,500 kilograms per hectare per year, based on mixed species or "polyculture". Where monoculture of certain species (catfish, tilapia, perch) occurs, average production can reach 2,500 kg/ha/year. These production rates are about half the potential maximum values. Critical factors contributing to low productivity include: weak technical understanding of modern pond management by fishers, leading to poor management practices; and lack of high quality inputs such as brood stocks, fish seeds (or fingerlings) from hatcheries, and blended fish feed. These constraints can be addressed over time with proper technical support and investment, leading to even higher incomes<sup>4</sup>. Productivity under polyculture systems can potentially be doubled based on the experience of several donor-assisted projects currently being implemented in the country. Intensively managed ponds, using improved fingerlings, commercial feed and modern pond management practices can generate up to 10,000 kg/ha/year of fish through two crops annually. In addition, these ponds can often be integrated with livestock production where animal waste is used for building up pond nutrients. Productivity can also be improved through genetically improved fish stock. There are numerous examples of good practices with freshwater aquaculture in Bangladesh – the key issue appears to be disseminating this knowledge and lessons learned, and securing adequate financing to scale up these practices across the country.

**Community-based producer groups and organizations need support:** Improved management of inland ponds for fish production can lead to higher yields and increased incomes. To facilitate these improvements however, and at the same time address issues of equity, gender, access to credit, and maintain a pro-poor focus, experience in Bangladesh and elsewhere shows that community-based approaches are needed, preferably within a broader integrated rural livelihoods model dealing with fish

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<sup>4</sup> The mission visited the Grameen Fisheries and Livestock Foundation project on Joysagar farm, which operates in Sirajgonj, Pabna, and Bogra districts. Since 1986-87, pond production has increased from 697 kg/ha/year to 3,250 kg/ha/year through gradual improvements to traditional management and introducing more intensive management in many ponds. The GFLF operates in 12 districts.

production, animal husbandry and agro-forestry. Several NGOs, including the Grameen Fisheries and Livestock Foundation (GFLF), BRAC, and WorldFish, are implementing small projects to pilot community-based aquaculture for fish production on a non-profit basis. Scaling up these small pilots however, will require external capital, which in the past has been met by a succession of donors including DFID, KfW, and the World Food Program of the United Nations.

**Poor quality of brood stocks is a serious issue for inland capture production:** The government currently operates approximately 110 fish seed multiplication farms that supply stock to private and community ponds. Generally, these institutions are inefficient and limited to domestic species. It has been suggested that up to 30 percent of the fingerlings produced are discarded unsold, mainly from the government hatcheries. Rationalization is needed; a useful first step might be for the government to divest its commercial fry and fingerling production, and concentrate instead on the issues of broodstock improvement and supply of quality brood fish to private hatcheries. A necessary role for government is to establish a comprehensive registration and certification system for private brood banks and hatcheries, and develop regulations governing feed stock composition, storage and application.

### 2.2.3 Brackish and Freshwater Shrimp Production

**Production and productivity are low but can be increased.**

In 2005, Bangladesh produced an estimated 196,000 tonnes of shrimp. Marine artisanal, brackish water (bagda), and freshwater (golda) shrimp accounted for around 56 percent of total shrimp production. Local productivity is low in Bangladesh (about ¼ that in India) due to the poor quality of brood stocks and fry produced by hatcheries, and weak management practices. Shrimp are often produced without proper pond preparation, fry nursing, stocking or feed management due to lack of technical knowledge and an aversion to risks involved with higher levels of investment. Consequently, production rates are very low, in some cases less than 200 kg/ha/year, or between 2 percent and 10 percent of highly intensive shrimp farms in Thailand. Very high mortality of shrimp has been reported in some shrimp farms using shallow ponds immediately after heavy rainfall due to changes in water pH levels. Improved productivity needs to be achieved through application of better technology and extension services, which can be provided both by the DoF as well as the private sector, for example, through contract grower programs managed by reputable processing plants. The government should also support the replacement of wild fry with hatchery produced fry and improvement of hatchery fry quality through testing, brood stock selection and nursing practices, development and dissemination of guidelines for proper hatchery management.

**Shrimp product quality must be improved.**

Bangladesh shrimp are mainly exported and must compete with production from other countries, not only on price, but also on quality. Smaller-sized shrimp from Bangladesh typically receive lower prices in the world market compared to those from other Asian countries because of a reputation for poor quality. Export markets in North America and



the European Union are extremely strict on quality control under the Hazard Analysis and Critical Control Points (HACCP) system<sup>5</sup>. Typically, Bangladesh will have half a dozen shipments rejected by US or EU buyers due to failed inspections. In 2009 however, 27 shipments have already been rejected, all from freshwater producers. Factors affecting quality include the dysfunctional processing industry; the small quantities of shrimp that each farmer harvests at any one time, leading to a long delivery chain before the product reaches the processing plants; and shortfalls of supporting public infrastructure such as rural road connectivity between shrimp producers and processing plants and other market infrastructure. Establishment and enforcement of effective policies, regulations, guidelines and public investments on quality assurance and control of export seafood products is a priority. Extension support to fisher communities producing and processing shrimp (and other seafood exports) can be done efficiently by linking both the fisheries extension arms of the government as well as the private sector with organized fisher community groups.

**Shrimp producer groups and related organizations need support.**

Shrimp farming is capital intensive, technology dependent, and the current industry structure is based on large numbers of small-scale farmers as producers, who are often some of the poorest members of rural communities, along with wealthier elites. Therefore, organization of farmer groups into larger producer units (federated common interest groups, small producer companies, etc) is important to facilitate access to technology and credit at low transaction costs, combine products into economic volumes, negotiate better pricing, and enforce and adopt production and marketing quality norms. A longer-term goal would be for larger and more successful producer groups to develop or purchase their own processing facilities.

**Mitigate environmental and social issues of shrimp farming.**

Shrimp farming has numerous potential environmental impacts including: the destruction of mangroves and salt marshes for pond construction; saline water intrusion and sedimentation from upstream water; and impacts from collecting prawn “seed” from inshore seas. Given that most shrimp production in Bangladesh is still fairly extensive, pollution issues are not yet at a serious level, but if increasing production from existing ponds is a national objective (as opposed to developing additional ponds), more intensive methods will be needed. This can lead to major environmental impacts when ponds are flushed because water in the shrimp ponds is often heavily polluted from treatment compounds, fertilizers, pesticides and disinfectants, antibiotics, probiotics, immune-stimulants, vitamins, and feed additives. The government needs to implement policy and regulatory measures, and improve coordination to mitigate these current and potential

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<sup>5</sup> The Hazard Analysis and Critical Control Points (HACCP) standards are an industry-wide effort approved by the scientific community as well as regulatory and industry practitioners, focusing specifically on food safety. In the case of food exporters (including seafood), seven principles must be met: 1) Conduct hazard analysis to identify where hazards can occur and preventative measures, 2) Identify critical control points in the food production process, 3) Establish critical limits - the maximum or minimum value to which a physical, biological, or chemical hazard must be controlled at a Critical Control Point, 4) Establish monitoring procedures to help adjust the process and maintain control, 5) Establish corrective actions when monitoring indicates a problem, 6) Establish verification procedures to ensure the HACCP system is working correctly, and 7) Establish effective documentation processes.

adverse social and environmental impacts. One approach would be through Environmental Assessment (EA) policy as set out in the 1992 Bangladesh National Environmental Policy. However, the current Environmental Impact Assessment (EIA) system in Bangladesh is inadequate to ensure environmental sustainability at the project level let alone promote environmental considerations at the strategic level. The Department of Environment (DOE) does not have the adequate resources or expertise to enforce the policy and ensure proper implementation of mitigation measures. Strengthening DOE and making it more efficient, transparent and accountable would place it in a better position as a lead environmental organization. The government should also continue with agro-ecological zoning for shrimp farming, taking into consideration a range of environmental parameters.

#### 2.2.4 Marine Fishing

**The marine sub-sector is characterized by overcapacity and poor performance.**

In 1974, Bangladesh extended its Exclusive Economic Zone (EEZ) to 200 nautical miles, effectively expanding the controlled sea area to 146,000 km<sup>2</sup>. Despite a large offshore area, the majority of marine production is from inshore, artisanal fishers. There is little potential to increase the marine fisheries harvest. Rather, efforts are needed to rationalize the existing fishing fleets and gradually work towards better performance. Basic management activities that need to be developed include updated stock assessments for key species (such as Hilsa<sup>6</sup>); developing an effective vessel registration system; exploring the use of bio-economic models to identify current and future resource rents for key stocks; implementing improved education and awareness programs; and piloting community-based fishing (often called co-management) for inshore fishers based on stronger resource rights and management plans. Some steps are already being taken to improve monitoring, control and surveillance capacity through a small Islamic Development Bank financed project, but additional support may be required.

#### 2.2.5 Cross-Cutting Issues

**Research, technology transfer and extension are weak links.**

The Bangladesh Fisheries Research Institute (BFRI) carries out and coordinates research on fisheries and aquaculture in Bangladesh, and provides training and research-based technology transfer. The general consensus of stakeholders interviewed by the mission was that the BFRI is well-resourced, has some excellent staff, and has done some useful work. However, the work program appears to lack focus; needs more coordination with the DoF and the private sector; and must shift towards more applied research and technology transfer. A strategic plan is needed for fisheries research in Bangladesh, based on wide stakeholder input. Technology transfer and extension were also raised as key issues across virtually every fishery sub-sector reviewed during the mission. There is considerable scientific knowledge in Bangladesh and from other countries with respect to

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<sup>6</sup> Like salmon, the hilsa spends most of its life in the sea, but migrates inland to spawn. Distances of 50-100 km are usually normal in Bangladesh rivers.

improved production methods, approaches for community based fishing, strengthening market systems and value addition, addressing health, environment and social concerns, etc. However, very little of this knowledge reaches the hands of practitioners in the field. There is a clear rationale for expanded resources for applied research, technology transfer, and extension services, but at the same time, opportunities to link up with NGO and private sector service providers need to be explored.

**Post-harvest systems and market chains require major reforms.**

The majority of small producers sell their fish in local markets due to long distances to larger urban areas, inadequate transportation, poor roads, or time constraints. These producers tend to rely on intermediaries who consolidate sufficient fish volumes to justify making the next connection in the delivery chain, usually auction markets. These auction markets generally operate in an open and fairly competitive manner, and many smaller producers prefer to sell through agents. Buyers of fish at auction then have a wide range of downstream supply channels. For shrimp, farmers generally produce small quantities at harvest, which similarly tie them into a system of selling to intermediaries. At the same time, most processing plants are not willing to deal with shipments of less than about 1 tonne. The solution for many of the marketing problems faced by smaller producers of both fish and shrimp would be to encourage the establishment of producers' groups and coordinate their harvests, so that higher volumes of production can be sent directly to central markets (or with shrimp, to processors) without depending on agents or intermediaries. These kinds of institutions would also facilitate technology transfer, training and extension services to the producers.

**Building human capacity and restructuring the fisheries department.**

The traditional role of the DoF has been related to protection and control of the fisheries resources with an emphasis on “doing everything”, including production, through its commercial hatcheries. The new role implied by the 1998 National Fisheries Policy requires a fundamental shift in approach, from command and control, to one that focuses more on providing policy leadership, regulatory oversight, delivering effective applied research, technical and extension support, and leading national monitoring, evaluation and reporting programs. More important, there is a need to shift skill sets to support wider use of community based fisheries management in collaboration with local communities, the private sector and appropriate NGOs.

**The fisheries sector requires better coordination and collaboration.**

As indicated earlier, many different ministries and departments have various responsibilities for managing fisheries and water resources. An institutional mechanism is needed to improve the coordination and collaboration across agencies. One suggestion from contributory reports to the National Fisheries Strategy and Action Plan, is to establish a high level Natural Resource Management Council (NRMC), chaired by the Minister of Finance and including senior representatives from seven key Ministries (Finance; Fisheries and Livestock; Water Resources; Local Government, Rural Development and Cooperatives; Land; Agriculture; and Environment and Forests). The NRMC would be an advisory body reporting to the Executive Committee for the National Economic Council to coordinate and promote issues relevant to the development of

natural resources in the country. Another recommended body is the Fisheries Management Executive Committee (FMEC) representing four key Ministries and their departments (Fisheries and Livestock; Water Resources; Lands; and Environment and Forests), plus the Bangladesh Fisheries Development Corporation, the private sector and civil society. The lower level FMEC would oversee execution of actions resulting from NRMC decisions.

**Complementary infrastructure must be strengthened.**

Public investments will be needed to improve complementary infrastructure such as: rural roads to improve connectivity of fisher groups with the processing plants and markets; improved wholesale markets with provisions for storing fish products beyond the day of receipt; and ice plants in rural growth centers where establishment of such plants are economically viable and would have impact in improving fish, prawn/shrimp product quality.

*2.3 Recommendations for further development of the fisheries sector*

**The Bangladesh fisheries sector has strong development potential.**

The WorldFish Centre has estimated that another 1 million ha of inland waters could potentially be developed for productive fishing in floodlands (70 percent of additional area); rivers and estuaries (10-15 percent of additional area); and inland closed waters (10-15 percent of additional area). Other sources suggested Bangladesh has 1.8 million fish ponds that are degraded and abandoned. Bringing this estimated incremental area under fish production could raise gross revenues from fishing by US\$2 billion, generate an additional 1.5 million full-time equivalent jobs, mostly with the rural poor, and create significant upstream and downstream indirect jobs and enterprises.

**New programs must build on lessons learned from previous Bank-financed projects.**

From 1979 to 2006, the World Bank, in some cases with other partners, has financed four projects in support of fisheries sector development with a total investment cost of approximately US\$103 million. The projects were:

1. Oxbow Lakes Fishery Project (CREDIT 890-BD)
2. Shrimp Culture Project (CREDIT 1651-BD)
3. Third Fisheries Project (Credit 2146-BD)
4. Fourth Fisheries Project (IDA-32760 )

The relevant lessons were:

- While projects can demonstrate technical breakthroughs, it is difficult for government to sustain progress because of inefficiencies in the bureaucratic organization system adopted.
- There are difficulties running a commercially viable operation under the constraints of the government of Bangladesh public service – commercial operations need to be shifted to the private sector.

- Effective extension services are a major factor in increasing fisheries production
- Stakeholders (including beneficiaries) should be involved from the planning stage of the project. In addition, NGOs are more effective than public sector agencies in motivation and formation of beneficiary groups.
- Mechanisms for cost recovery and/or sharing should be agreed with all concerned during project preparation.
- Flexible project design and adjustments during implementation can play an important role in achieving success. While donors can usually accommodate changes, government still finds it difficult to do so.
- Untested concepts should be tried out first at a pilot level.
- Increasing the numbers of women fisheries officers operating at field level, can facilitate provision of technical assistance to women fishers.
- Resolving the institutional issue of leases is fundamental for successful development of common property resources. This is particularly important for inland open water fisheries but could also apply to culture fisheries and marine fisheries.
- Simple cost-effective entry points are needed in projects dealing with open water fisheries.
- Political support is critical to sustain nature conservation efforts.
- Dealing with social change demands longer time and realistic targets.

**Achieving the development potential in the fisheries sector requires clear guiding principles.**

Any new programs supporting the fisheries sector should be anchored by the following guiding principles:

1. The overall goal must be to improve the livelihoods of the poorest groups in society who rely on fishing as a source of livelihood,
2. Community-based management must be a primary objective with a long-term goal of empowering rural people over resource management, production and marketing,
3. Rural poverty will be best served by an integrated project approach that improves natural resource based livelihoods (fisheries, animal husbandry and dairying, agro-forestry, etc) and alternative livelihoods through Self-Help Groups and Income Generating Activities,
4. Programs should build on lessons learned from earlier Bank-financed fisheries projects and ongoing rural livelihood projects, as well as complementing programs of other donors and NGOs, where possible improving on the design and supporting scaling up activities, and working through partnerships,
5. The legal, policy and regulatory framework in government, and the role and core functions of the Ministry of Fisheries and Livestock must support community based management,
6. To achieve desired impacts and outcomes will require sustained technical and financial support.

Subject to the previous guiding principles, a dialogue needs to be opened with the government of Bangladesh and other stakeholders around the following possible activities that would support sector development in the following priority areas, within the broader direction of the 2006 National Fisheries Strategy and Action Plan:

#### *Inland Capture Fisheries Development*

**Aim:** Sustainable management of inland capture fisheries for fishing communities and users.

**Key components of support:** Reform the leasing policy for inland water bodies and fish resources, underpinned with a strong legal basis for community-based management. Leasing reform should focus on resource-user access rather than revenue generation by the state, and consider innovative approaches such as renewable leases based on performance. Further develop and scale up community-based fisheries management including better local control of fishing effort, piloting new approaches for improving productivity such as cage fishing, addressing critical habitat restoration, and use of improved stock. Develop local community institutions and higher level community-driven institutions to facilitate improved market access, technology transfer, and extension service delivery.

#### *Aquaculture Fisheries Development*

**Aim:** To support the continued development of aquaculture as a key supplier of animal protein by) providing a regulatory structure to ensure quality inputs, and (b) by providing services to enhance knowledge to promote production.

**Key components of support:** Scale up community-based management of inland and coastal aquaculture. Reform the leasing policy on government-owned ponds to support stronger use-rights by communities. Develop, pilot and scale up a new computer-based registration and certification scheme for all hatcheries that produce fingerlings, and draft regulations for other input suppliers, such as feed producers. Support the growth of the private sector for brood stock supply and hatcheries, including privatization of government facilities. Develop local community institutions and higher level community-driven institutions to facilitate improved market access, technology transfer, and extension service delivery.

#### *Shrimp Fisheries Development*

**Aim:** A shrimp sector recognized internationally for high-quality shrimp. It should be produced using socially responsible and environmentally sustainable production methods.

**Key components of support:** Develop a regulatory framework with participation and recognition by all stakeholders to improve standards for shrimp sector development – covering production, quality control, marketing and export, environment and social aspects. Where feasible, support the transfer of processing capacity to community based organizations.

### *Marine Fisheries Development*

**Aim:** Ensure the sustainable management of marine fisheries by allocating fishing rights to communities and fishing groups, and by providing the regulatory framework for this management.

**Key components of support:** Review and reform government policy to favor resource access on a priority basis to poor shore-based fishermen, then to offshore fishermen, then to commercial fishermen. Establish a register of fishers and vessels. Support ongoing efforts to develop updated stock assessments for key species and provide technical assistance for initial bio-economic modeling of resource rents for key marine fisheries. Review policy and legislation governing fishing rights in offshore waters and develop a package of reforms to guide improved sub-sector performance. Undertake comprehensive education and awareness programs on the state of the marine fisheries and potential reform measures that could support long-term sustainability. Pilot co-management programs based on stronger resource access rights for communities.

### *Post-Harvest Quality Control*

**Aim:** Ensure that all fish and fishery products marketed either for export or domestic consumption satisfy quality requirements cited in HACCP (Hazard Analysis and Critical Control Point) and other protocols – including traceability and social accountability.

**Key components of support:** Finance education and awareness programs to help ensure that food safety requirements and chain of custody for exports are met for consumers in both Bangladesh and importing countries relating to safety, social equity, and environmental management. Promote self-regulation through appropriate local industry organizations and NGOs.

### *Planning, Monitoring and Evaluation*

**Aim:** To develop systems in the Department of Fisheries capable of monitoring progress towards the objectives of the National Fisheries Policy, and evaluating activities directed at these objectives.

**Key components of support:** Develop a system to monitor progress towards policy objectives, managed by the Department of Fisheries incorporating indicators representing inputs, outputs, processes, impacts and outcomes. Develop and enforce protocols for fisheries data collection sponsored by external organizations and establish networks with other departments and agencies for data sharing and common geo-referencing points for GIS. Undertake regular surveys of water bodies in Bangladesh using remote sensing and GIS for improved planning and monitoring.

### *Institutional Strengthening*

**Aim:** A competent national authority for fisheries management that focuses on core business functions and delivers effective and efficient services to support sector development as per the directions in the 1996 National Fisheries Policy and 2006 National Fisheries Strategy.

**Key components of support:** Review and revise the current legal and regulatory framework to support more effective requirements and standards for bio-diversity conservation of floodplains, management of ponds, hatcheries, shrimp farms, feed plants. Initiate a strategic planning process within the Ministry of Fisheries and Livestock, with special emphasis on the Fisheries Department to guide a transition away from program delivery to providing policy leadership, regulatory oversight, delivering effective applied research, technical and extension support, and leading national monitoring, evaluation and reporting programs. This would include a strategic review of research and development programs of the Bangladesh Fisheries Research Organization to ensure an appropriate focus on applied research to address key issues and opportunities facing the sector, and identify options for improved performance with technology transfer and extension services, particularly for communities. Strengthen the human resource capacity of the Department of Fisheries, its partners and primary stakeholders, to ensure that personnel at all levels have the knowledge, skills and techniques to enable them to make productive use of their potential. Support appropriate training programs and systems for effective service delivery. Establish and support new coordination and monitoring institutions such as the Natural Resource Management Council and Fisheries Management Executive Committee. Assist the Ministry of Environment and Forests to strengthen its capacity for delivering effective environmental assessment services in support of fisheries sector development.

#### **Potential Investment Costs and Time**

It is too early to define in concrete terms the scale and scope of a new support programs that would be based on improving both natural resource-based and alternative rural livelihoods. However, some guideposts are possible. For example, the earlier Bank-supported Fourth Fisheries Project had a planned investment cost of US\$60.8 million. Building on this ground-breaking work at approximately the same investment level and scaling up ongoing community-based fisheries pilot models supported by various bilaterals and NGOs, it is not unrealistic to envision an investment cost related to fisheries development of up to US\$100 million. Adding alternative livelihood components such as animal husbandry, horticulture, dairying, agro-forestry, and small enterprise development, could double the investment cost. Defining the “right” scale of project and components will require further discussions with the government of Bangladesh and other partners, as well as an assessment of the absorptive capacity of implementing agencies.

Equally important to financing is the time period for any new project. Reforming the fisheries sector, even with a focus on inland fisheries only, will take far longer than the usual cycle of a single 5-6 year project. It would be more realistic to adopt a 10 year time-horizon and plan for either a series of projects (financing and implementing a repeater project based on successful performance of the first project) or a longer-term Development Policy Loan. These and other options can be explored further in subsequent dialogue with the government and relevant partners.



### 3. Dairy Subsector

#### *3.1 Status of the dairy sector in Bangladesh*

##### **Livestock is an important economic activity in Bangladesh.**

Based on 2005 data, Bangladesh (BD) has about 24.5 million heads of cattle and 0.9 million buffalos. The estimated numbers of goats, sheep, fowls and ducks amount to respectively 18.4 million, 2.4 million, 164 million and 13.5 million. Among the total cattle population there are about 10 million lactating animals (about 3 million of which are improved cows or crossbreds) held by about 3.6 million households (average of about 3 cows per household) which produce an estimated 2.28 million metric tons (MMT) of milk (2006-07 data). It should be kept in mind that all these figures are at best fair estimates. BD does not collect livestock data on a regular and systematic basis and no comprehensive livestock census has been carried out so far; nor are there good data on livestock holding across land holding categories. On the other hand a sample survey (but of unknown statistical representativeness, see Saadullah and Hossain 2000) reports cattle stock holdings per household as 2 for the landless, 2.9 for small holders, 3.7 for medium farmers and 4.7 in case of large farmers.

##### **Milk production has a high poverty reducing impact.**

Milk production is an important source of income especially for smallholders and landless households; for landless households who own dairy cattle over 60 percent of their household income comes from the sale of milk. Milk production is thus proportionally more important for smallholders and landless households and constitutes an important source of protein for these groups. Even though milk production is highly concentrated in the Baghabari area in Sirajganj district in the Northwestern part of the country, households throughout BD own dairy cattle. Dairy in BD is mainly a smallholder business: the majority of dairy cow owners hold 1 or 2 local breed cows with few farmers holding more than 5 animals. Importantly a substantial share of the dairy cows (probably about 15 percent) is held by landless households.<sup>7</sup> Given the total of 3.6 million households that own dairy cows, about 25 percent of all milk producers are landless households.

##### **Average productivity of milk cows in Bangladesh is low.**

Of the total cow population in BD about 70 percent are local nondescript cows: small in size with average adult body weight of around 200 kg, lactation yields of 250 kg of milk and lactation length some 180 days. Daily average milk yield of these cows is low: only some 1-1.5 liters. Milk yields of crossbred cows, however, are much higher: halfbreds and higher grades yield about 10 liters per day on average over a 300 day lactation period while lower grades average 5 liters per day over the same lactation length. Peak yields of crossbred cows can reach 15+ liters per day. There is ample potential to implement targeted interventions for increasing productivity of milk to support livelihoods and incomes of the poor rural people.

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<sup>7</sup> In BD landless households account for about 10 percent of all rural households. About 75% of all rural households are classified as smallholders and 15% are medium and large landowners.

**The organized milk sector in Bangladesh remains relatively underdeveloped.**

Less than 5 percent of total milk production in BD is channeled through the organized sector which operates nearly exclusively in urban areas catering to urban demand. About 81% of total milk output in BD is marketed through the unorganized traditional sector made up of milk producers, milk traders and consumers; the latter include both households and (especially) halwais who process liquid milk into ghee, curds and sweets. About 15% of total milk production is withheld by producing households for own consumption.

**The milk sector in Bangladesh can be characterized as a classical sellers' market.**

Over the years increases in demand for liquid milk in BD have greatly outstripped supply growth, leading buyers grab whatever surfaces as surplus in the parochial markets or at farm gates, unmindful of the quality and at the highest producer prices paid anywhere in the Indian subcontinent. The quality of milk delivered to buyers both in the organized and the unorganized sector is more or less the same: most milk is adulterated, unhygienic and with high bacterial load, with fat and solids non fat (SNF) levels of around 3.5 percent and 7.8 percent respectively (a good milk cow in BD should test 4.0 and 8.6 for respectively fat & SNF).<sup>8</sup>

**The organized milk sector consists of a limited number of firms all of which source from the same milkshed in the northwest of the country thus ignoring dairy potential in other parts.**

In BD the organized dairy sector has many players in the milk procuring, processing and marketing field. The organized dairy processors manage to collect only some 4 percent of the milk produced in the country, with hundreds of plate chillers and bulk coolers dotted across the potential milk districts (see Map below). There are about ten formal dairy plants in BD (Table 1) but nearly all underutilize their installed capacities. Only four of these can be considered as major dairy firms (capacity of at least 10,000 l/day) and of these four the Bangladesh Milk Producer Cooperative Union Ltd (better known as Milk Vita, installed capacity is 297,000 l/day and turnover 250,000 l/day) is the brand and price leader, accounting for nearly 80 per cent of the organized milk trade in Bangladesh (excluding trade in imported commodities) (see also Annex 1). The other three major plants include Arong dairy (belongs to BRAC, capacity and turnover 60,000 l/day); PRAN dairy (the largest purely private dairy firm, capacity 50,000 l/day, turnover 40,000 l/day); and Aftab dairy (capacity 20,000 l/day, turnover 7,000 l/day). All four major dairy firms source an important share their milk from the same milkshed consisting of a number of districts in the northwest of BD (Sirajganj, Pabna, Gaibandha, Rangpur, Joypurhat).

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<sup>8</sup> The SNF level is almost a constant and will not vary like fat test, unless the cow is sick with serious metabolic disorders or else the milk is adulterated with water which is universal practice throughout BD.

**Table 1 Ten major milk processors in Bangladesh**

Name	Capacity (l/day): Processing / Chilling
Milk Vita	297000 / 150000
BRAC	60000 / 60000
PRAN	50000 / 54000
Grameen (GMPF)	0 / 10000
Amo Milk	10000 / 10000
Aftab Dairy	20000 / 20000
Tulip	5000 / 3000
Bikrampur Dairy	0 / 5000
Rangpur Dairy	10000 / 26300
Akij	10000 / 10000
<i>Total</i>	462000 / 348300

Milk Vita is officially a cooperative society; BRAC and Grameen are NGOs; and all others are private sector companies.

**Milk in Bangladesh is expensive resulting in low average consumption.**

Milk in Bangladesh is expensive: farmers receive Tks. 28-32 /l (\$0.41-\$0.46/l)<sup>9</sup> compared to only \$0.30/l in India. This is the main reason why average milk consumption in Bangladesh (only about 38 g/person/day or 14 kg/person/year with little growth over time) is low compared to India and Pakistan (about 85 kg/person/year which meets the WHO recommended daily intake of 250 g/day). On the other hand milk has a relatively high income elasticity of demand and therefore milk consumption can be expected to increase as long as incomes continue to rise (in addition to increases in consumption as a result of population growth).

**A substantial share of total milk consumption in Bangladesh is met by milk powder imports.**

Relatively low domestic milk production (see Table 2) combined with perceived differences in quality between domestically produced and imported dairy products make BD a large dairy importer. Milk production in BD has increased over time but only at an average of about 1.3% per year over the past decade, compared to nearly 4% in India and Pakistan. As a result Bangladesh has become heavily dependent on imported milk solids for meeting the growing urban demand for milk and milk products. Imports of milk powder exhibit an increasing trend over time and last year BD imported about 55,000 MT of milk powder at a cost of about \$165 million. Besides imports, a number of domestic dairy companies (principally MilkVita and to a lesser extent PRAN) also produce milk powder in small quantities.

<sup>9</sup> Data refer to prices paid on the mainland; prices on the Chars are significantly lower (Tks. 22/l or \$0.32) due to transportation costs to the mainland.

**Table 2 Domestic milk production in Bangladesh**

Year	Production (MMT)
2001-02	1.78
2002-03	1.82
2003-04	1.99
2004-05	2.14
2005-06	2.27
2006-07	2.28

Source: Bangladesh Economic Review 2008



Map courtesy of E. Madhavan, Consultant, Bangladesh Dairy Development, World Bank, 2005

**Domestic producers of liquid milk are unable to satisfy local demand but there is ample potential to increase domestic production.**

About 17 percent of total milk consumption in BD is covered by imports but this percentage rises to 87 percent if only the organized sector (which caters exclusively to urban demand) is considered. In other words, locally produced fresh milk accounts for only 13 percent of urban milk demand. This is despite the fact that local milk is cheaper

than milk reconstituted from imported milk powder. This allows us to conclude that stimulating domestic milk production should be an economically viable proposition.

**Even though domestically produced milk is cheaper than reconstituted milk powder, dairy farmers will need to reduce their unit production cost.**

The retail price of fresh (pasteurized) milk (3.5 percent fat and 8.5 percent SNF<sup>10</sup>) is Tks. 50/l; in comparison, milk based on reconstitution of milk powder costs between Tks. 60-65/l. Thus, even though prices of imported milk powder have fluctuated over time, currently the retail price of liquid milk compares favorably with that of imported milk powder. Despite the fact that domestically produced fresh milk is competitive, milk is still expensive relative to other countries in the region and pasteurized and UHT milk are out of reach for most consumers. So unless local dairy farmers can significantly improve the productivity of their cows and lower the per liter cost of production, milk consumption will continue to exhibit slow growth driven only by income growth and population growth. The price elasticity of milk tends to be fairly high and consumption growth can only take off if milk would somehow become cheaper.

**Supply side constraints limit the expansion of milk production in the organized sector.**

Current milk production in Bangladesh in terms of liquid milk volumes is about 2.3 MMT per year or about 6.30 million liters/day (LPD). The existing processing capacity is only about 0.46 million LPD or 7 per cent of the total production. The organized sector now markets some 0.25 million LPD (4 percent of the production) as liquid milk and milk products almost exclusively in urban demand centers; imported commodities (mainly milk powder) contribute the remaining 1.25 million liters LME (Liquid Milk Equivalent<sup>11</sup>), adding up to the total current urban consumption of about 1.5 million LPD. In other words, the current situation in the organized milk sector is such that despite domestically produced milk being cheaper than reconstituted milk from imports, domestic producers are able to satisfy less than 15% of total urban demand, the remainder being filled with imports of milk powder. If BD plans to replace imports by locally produced and processed milk, the organized sector of the Bangladesh dairy industry must be able to market at least 25 percent of the total current milk production, equivalent to about 1.5 million LPD. To do this the total installed processing capacity in the country should be 2.0 million LPD (allowing for the seasonal production fluctuations), chilling capacity not counting.

**Increases in urban milk supply should come from increased national milk production.**

Increased urban milk supply by the organized sector should not deprive the rural consumers of their daily supply of milk, but should instead be drawn from incremental production resulting from increased productivity engineered through a massive production enhancement program. This would involve removing supply side constraints, not only to enable domestic producers to increase their share of the current urban market

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<sup>10</sup> As pointed out earlier the milk received by dairy companies is mostly of inferior standard and needs to be brought up to standard by adding milk powder.

<sup>11</sup> One kg of full cream milk powder makes 8.33 liters of liquid milk.

for fresh milk, but also to increase production capacity in anticipation of future increases in demand in case prices would come down as a result of lower production costs.

**Low genetic potential of local cow species and lack of grazing land make for high production costs of milk.**

By far the larger share of the dairy herd in BD consists of the local dairy cow breed (*Bos Indicus*) whose inherent productivity is low. On average local cows produce between 1.0 and 1.5 l of milk/day during 150-200 days per year, resulting in an average production of 206 kg/animal/year compared to about 800 kg/animal/year in India (and 7000 kg/animal/head in the US and more than 9000 kg/head/year in The Netherlands). Low milk yields result in relatively high production costs of milk exacerbated by lack of grazing land (grasses collected from fallow lands, embankments and floodplains often are not high quality) and high cost of animal feed. Regarding the latter, private feed mills are very few and their feed price is high and beyond the reach of many smallholder farmers. As a result, smallholder dairy farmers mostly rely on feeding concentrates procured from local market outlets which are not only relatively expensive but also of dubious quality.

**Despite a number of localized efforts, a systematic and country-wide effort to improve the productivity of the dairy sector does not currently exist in Bangladesh.**

At the end of the day improving the dairy sector boils down to lowering unit production cost of milk in order to be competitive and provide a wider group of consumers with access to fresh milk. Even though a limited number of localized efforts have been able to successfully raise milk yields and build an integrated dairy value chain (e.g. the Joysagar project of the Grameen Livestock and Fisheries Foundation), the vast majority of dairy farmers in BD is stuck in a low yield-low income mode of milk production based on low input traditional technologies.

**Public sector assistance to the dairy industry is underperforming.**

Public sector institutions that cater to the needs of the livestock industry include the Ministry of Fisheries and Livestock (responsible for the overall direction of the industry); the Department of Livestock Services (DLS) which is responsible for extension services to farmers; and the Bangladesh Livestock Research Institute (BLRI) which is responsible for carrying out research on animal genetics and livestock feed. There exists general consensus in BD that none of these institutions performs its designated tasks in a satisfactory manner.

*3.2 Recommendations for further development of the dairy sector*

Based on the meetings and field visit the mission concludes that **dairy development provides an untapped potential to supplement and improve livelihoods of millions of landless and marginal people in rural Bangladesh.** In addition the mission would like to make the following specific observations and recommendations:

**Upgrading the dairy industry in Bangladesh requires an integrated approach that pays adequate attention to the development of each stage of the dairy value chain.**

Achieving significant and sustainable increases in milk production and increasing dairy farmers' incomes requires systematically removing each bottleneck in the dairy value chain, starting from the supply of inputs and services all the way to milk marketing. Knowledge creation and dissemination are crucial elements: further development of the dairy value chain in BD will not be successful without improving the technical knowledge throughout the chain. This implies the need for renewed emphasis on genetic improvement; feeding requirements; and animal health and hygiene (including training of new livestock service providers in AI and disease prevention and treatment, and farmer training in animal husbandry and milk handling).

**In order to improve the productive base, genetic improvement of dairy cows should have first priority.**

In order to increase milk yield potential upgrading the genetic quality of dairy cows is an imperative first step. This requires the establishment of permanent breeding centers which would carry out a systematic cross-breeding effort involving artificial insemination (AI) of local cows with semen from imported bulls (preferably Holstein-Friesian or Jersey). Semen production stations should also be established: currently only MilkVita and Arong Dairy produce semen on a limited basis but both have not had fresh bulls for a long time.

**The potential of buffaloes should be exploited.**

Buffaloes have so far been neglected in BD. While more information is required in order to be assess the exact reasons for this, buffaloes in BD are similar to those in India and Pakistan and potentially constitute a repository of good genetic material which could be exploited in order to turn buffaloes into high yielding milk, beef and work animals. This would involve continuously upgrading of existing animals with a good breed, through a massive artificial insemination (AI) campaign carried out by the milk unions and the dairy cooperative societies (DCSs). Milk Vita could take up the responsibility of promoting buffalo breeding and development in their areas of operation through their DCSs and the DLS in the rest of the country. The upgraded buffaloes could add to the milk / beef / work animal population in Bangladesh around 0.3 million high-yielding buffaloes every year if the AI campaign for replacing the nondescript buffaloes in the country would be vigorously implemented.

**Both quantity and (especially) quality of cattle feed need to be improved.**

The genetic potential of improved animals can only be utilized to its fullest extent with adequate feeding. This would require the establishment of feed plants which would produce balanced feed rations. Currently most dairy cows are fed with little else than crop residues (mainly rice straw). Experience from India suggests that since profit margins in the feed industry are small, the minimum production capacity of such plants should be 100 MT/day. Improvements in cut-and-carry feeding systems are also feasible (see below).

**Bangladesh will need to find innovative ways to improve cut-and-carry cattle feeding.**

The lack of grazing land in BD makes it imperative to look for cost-effective solutions for cut-and-carry cattle feed systems. One such solution could be a sort of sharecropping arrangement in which landowners would allow landless dairy cattle holders to cultivate high-yielding fodder species on their lands in return for a percentage of the proceeds of the fodder sales. If cultivated with the appropriate species one hectare of land is able to yield up to 400 MT of fodder which would be sufficient to feed 30-60 crossbred dairy cows during one year (based on a daily fodder intake of about 25 kg/cow/day). For more details see Annex 2.

**Improvements in animal health are needed with crossbred cows.**

Crossbred cows are relatively high value animals and dramatically increase the economic returns to adequate health care. Existing veterinary services are mainly public sector driven (Department of Livestock Services) with limited outreach capacity (only 6% of animals receive public health care) and shortages of vaccines and medicine. The public sector has no mobile veterinary units and farmers must bring their animals to veterinary hospitals of the DLS. Unlike the DLS' focus which is on curative care, the emphasis should be more on preventive veterinary care (including deworming, vaccinations etc.) provided on a regular basis to dairy farmers by well-trained specialists. The latter would also provide AI services and may even act as cattle feed providers. DFID's Community Livelihood Project (CLP) promotes the development of a cadre of trained Community Livestock Service Providers who provide basic curative and preventive care for animals to rural people on fee-for-service basis in areas that cannot be reached by the DLS staff. Organizing dairy farmers into groups and associations and linking them with cooperatives and processors may provide a cost-effective channel for acquiring demand-led veterinary services by farmers.<sup>12</sup>

**Lack of capital among poor people may justify subsidies for asset creation.**

Many dairy farmers are small farmers or landless people who normally lack the capital required for the purchase of improved dairy cows, feed, veterinary care etc. Therefore subsidized credit (or even better, grants) to poor rural families for the acquisition of dairy

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<sup>12</sup> For small ruminants and backyard poultry, Bangladesh should initiate a village-based extension and disease intelligence system. Such a system would mainly consist of village lady link workers in all major villages trained in vaccination of indigenous backyard poultry and small ruminants. Mortality among indigenous poultry exceeds 80 percent due to diseases like new castle disease and avian influenza. Village house wives would be trained by existing DLS livestock service providers in low cost technologies for feeding poultry and small ruminants like termite culture, azola culture, pod feeding of small ruminants and candling of indigenous fowl and duck eggs set for hatching under brooding hens regularly by back yard poultry units in the villages (see also Annex 2). These village lady link workers would act as private practitioners providing the inputs and technologies to the village communities, and in this way earn a small income for the services they deliver. They would be linked to the nearby veterinary surgeon / government livestock service provider for two-way communication with the DLS for extension messages / technology transfer on a regular basis. The system of village lady link workers would thus function as an independent village livestock extension and disease intelligence constituency in Bangladesh outside of the government. But the latter would greatly benefit since the village lady link workers would enable DLS to reach out right into the villages without adding to their costs and permanently employed workforce.



cows may be considered as part of a larger overall dairy development project. At the same time farm level credit and savings could be encouraged by regional milk unions and Milk Vita through promotion of self help groups (SHGs) among milk producer members of all DCSs and linked to the financial institutions / commercial banks in rural areas. This would ensure the building up of a micro credit establishment in all DCS villages granting producers instant access to credit and help payments to farmers by the DCSs.

**Given poor people's limited capacity and willingness to absorb risk, establishment of a livestock insurance fund is desirable.**

In order to get started, a livestock insurance fund may require seed capital from a donor agency (as part of a larger overall dairy development project). After that it should be running on its own: a viable and sustainable example was encountered in the approach used in the Joysagar Farm Project of the Grameen Motsho O Pashusampad Foundation (GMPF, an association not for profit that manages a number of community-based integrated crop-livestock-fisheries activities under a value chain approach) in Sirajganj, Pabna and Bogra districts . In the approach followed by the Joysagar Farm Project, the livestock insurance fund is financed by a levy of 2.5 percent of the price of livestock acquired by its members; plus 25 percent of the interest payments received from loans given out by the GMPF to its members; plus a levy of Tks. 0.3/liter of milk marketed through the GMPF.

**Efforts aimed at increasing milk yields require complementary efforts to improve milk marketing.**

Most dairy farmers sell to village-level milk collectors who in turns sell to local processors or dairy plants. An upgraded dairy sector would include an appropriate milk procurement and marketing system including a network of collection centers with cooling tanks where each sample of milk is tested and paid for based on fat content; processing plants; and a marketing system designed to reach as many potential consumers as possible. Thus, traditional village-level milk collectors may be replaced by a more formal and modern milk marketing system.

**Village primary dairy cooperative societies are a promising way of incorporating small and poor dairy farmers in formal dairy value chains in the organized milk market.**

The Milk Vita experience amply demonstrates the power of village primary dairy cooperative societies (DCS) to generate enduring supply relationships with their affiliated milk union. In the case of Milk Vita this is in spite of the overwhelming government interference, denying them their rightful place in the management of their affairs. But no other examples or models of farmer empowerment and involvement in milk collection exist in Bangladesh and therefore it would be prudent to nurture and nourish the institution of DCS in villages as supply units for all forms of dairy enterprises, cooperative unions or private companies.

**Bangladesh needs to move ahead with the establishment of a National Dairy Development Board.**

In its last week in power earlier this year the former Caretaker Government established the Bangladesh Dairy Development Council (BDDC) under the Local Government Department of the Ministry of Local Government and Rural Development. According to its present charter the BDDC would function as a largely a regulatory body (in practice the BDDC is not yet operational). But eventually BD would need to establish an independent and focused National Dairy Development Board or NDDDB (possibly along the Indian model) whose role would be to facilitate the development of the dairy industry rather than regulating it. Thus the role of the NDDDB would be distinctly different from the already formed BDDC (see Annex 3 for suggestions regarding organization, role and functioning of a NDDDB). Meanwhile and as long as a full-fledged NDDDB is not yet up and running, the BDDC may be re-vamped and transformed into an autonomous Dairy Foundation whose role would be largely of a fiduciary nature. In case a new Livestock Project would materialize, financial resources provided by such a Project would be channeled through, and managed by the Foundation on behalf of the Government.

**In order to further develop the organized milk sector and cut down imports of milk powder, new milk sheds must be identified and developed.**

An important task of the NDDDB of Bangladesh would be fostering the development of new milksheds. Each of these would be spread out in a cluster of contiguous districts (just as is the case with the current milkshed covering a number of districts in the northwest of BD) and promote a certain number (for example, 25) dairy cooperative societies (DCSs) in as many villages in the milkshed initially, and then affiliate them to register a new Regional Milk Producers' Union. The Milk Union would then take over the task of DCS promotion in the milkshed and establish a much larger number (for example, 1000) DCSs involving an even larger number of primary member producers (the exact number depending on the number of primary members for each DCS). The DCSs would have to be appropriately equipped and organized in order to adequately perform their main task of supplying sufficient and reliable quantities of high quality milk for processing in the organized sector (see Annex 4 for detailed suggestions).

**Scale building activities in new milk sheds would allow the development of new dairy plants.**

In each new milkshed the Milk Union with financial inputs from the NDDDB would build and establish one or more large milk processing plants. While the exact size of the plant(s) needs further study, we give below an illustrative example of what the new milk sheds could look like in terms of size, capacity etc. Assume a total installed processing capacity of 1.5 million liters per day (LPD), along with one or more milk powder plants with a total capacity of, say, 300 MT per day, for balancing seasonal surpluses of milk supply and lean season deficits in the urban markets. Whether to go for a single large plant or several smaller plants appropriately located in the milk shed also would need careful consideration even though scale economies may dictate a preference for a single plant. The approximate costs of such a plant / plants of such size would be about Tks. 1.5 billion (\$ 22 million). This investment would also cover 200 bulk milk coolers (BMC) of 2000 liter capacity each installed in the milk shed at the rate of one per cluster of 5 DCSs.

The organizational cost of 1000 DCSs and equipping them with milk collection and milk testing equipment will be included in the Tks. 1.5 billion. The Milk Union could also establish a cattle feed milling plant with a daily capacity of, say, 200 MT and arrange to make balanced cattle feed available for retail sale in every single DCS. The approximate cost for the cattle milling plant would be Tks. 300 million (\$ 4.4 million).

## **ANNEX 1**

### **Milk Vita: Issues and Potential Solutions**

Milk Vita (the official name is Bangladesh Cooperative Milk Producers' Union or BCMPU) is incorporated as a Cooperative Milk Union under the Bangladesh Cooperative Societies Act. From 1965 onwards Milk Vita has enjoyed the patronage of the Government of Bangladesh in terms of grants for investments and managerial assistance including aid and funds from international agencies. Total government grants have now exceeded 80 per cent of Milk Vita's equity base, making the Cooperative function like a regular department of the government. Milk Vita is not therefore, in the true sense of the word, a farmer's cooperative since milk producer members have no say in the management of the firm. On the other hand, members get a good market for their milk and are paid a very good price. The government never allowed the Cooperative to have their own charter or to manage its business to the best advantage of the members. However, it can also be argued that BCMPU stands out as the living testimony to the appropriateness of the cooperative way of organizing the milk business, in spite of all its shortcomings. No other body in the private or NGO sector in BD has so far been able to win over the trust of the farmers nor have any of them been able to come close to Milk Vita's reach in milk procurement (80 per cent of the total organized dairy industry in BD). But be that as it may, Milk Vita in its present form is in no position to lead the dairy industry in Bangladesh in the coming years and it is time that it should be left alone to seek its destiny as it deems fit. Alternatively the Government of BD should transfer its equity share to the farmers, enable the Cooperative to elect a truly representative Board from among its members, allow the Board to recruit and appoint all its employees right from the Managing Director to the watchmen, remove all government employees from all posts and levels, and allow the Board to manage their affairs independently. This would create an environment that allows the Board to carry out its functions appropriately in order to further the Government's social agenda of enhancing livelihoods, enlarging food security and empowering rural communities. At the same time it is also necessary to carry out a process of delimitation of the jurisdiction of the BCMPU. Even though its present jurisdiction covers all 66 districts in Bangladesh, 90 per cent of BCMPU's milk procurement comes from the Baghabari milkshed. As a result the remaining districts and other (potential) milksheds remain undeveloped. It may be worth to identify three more milkshed areas and try to develop these by promoting milk projects, either as regional cooperative milk unions or private milk companies.

**ANNEX 2**  
**Detailed account of field visits (livestock part)**

The Livestock Scoping Mission had the opportunity to make field visits in the SIPP (Social Investment Program Project) area in Gaibandha district on 25 March 2009; and in the DFID CLP (Chars Livelihood Project) area in the Deluabari Char on the 26 March 2009 (Table A2.1). In the SIPP areas in Gaibandha the Mission was accompanied by the Project Implementation Team of the SDF (Md.Shahid Rahmat Kadir, M.U.M. Abdul Maleque, and colleagues); and in Deluabari Char by the DFID Team Leader Mr. Roland Hodson and his Team.

**Table A2.1 Dairy mission agenda**

Date	Location	Visit Details
23.3.09	Dhaka City	CARE Dhaka office: Discussions with Muhammad Nurul Amin Siddiquee, Project Coordinator, CARE Dairy Value Chain Project.
	Dhaka City	Bangladesh Milk Producer's Cooperative Union Ltd (Milk Vita): Discussions with Md.Nurul Islam, General Manager; and colleagues
	Dhaka City	Aftab Milk & Milk Products Ltd: Discussion with Joynal Abedin, Deputy General Manager
24.3.09	Dhaka City	Pran Dairy Ltd: Discussion with Md.Rakibur Rehman, Chief of Dairy and Pran-RFL Group; Md. Eleash Mridha, Executive Director; and Usma Chowdhury, Director of Finance
25.3.09	Gaibandha	Visit and discussions at the District Office of the Social Development Foundation (SDF): Md.Shahid Rahmat Kadir, M.U.M. Abdul Maleque, and colleagues
	Village: South Kaziwari	Meeting & discussions with Women's Group: Beneficiaries of SIPP: Livelihood Project: Fattening of Beef Cattle, Goat Farming, Dairy Farming, Sericulture, Backyard Poultry (Local Birds - Chicken and Ducks), Puffed Rice Making, Rice Husking, Rice Trading, Grocery Shop, Vegetable Vending, Investing in Cycle Rickshaws, and different Skill Trainings for livelihood development
	Village: Choto Chatragacha	Meeting & Discussions with Women's Group: Beneficiaries of SIPP: Livelihood Project Activities: Grocery Business, Bamboo Trading, Manufacture of rice cookies, Goat farming for meat, Rice parboiling and trade, Cycle Rickshaw, Dairy Farming
	Village Bokshi Ganj	SDF Cluster Office: Discussions with SDF Team
	Village Rifayatpur	Meeting with SIPP Women's Group, Goat farming, Dairy farming with crossbred cows, Milk Collection and Marketing in the local market: over 100 LPD, Tailoring and Garment making.
26.3.09	Deluabari Char	Visit the activities of DFID's Community Livelihood Project (CLP) with Roland Hodson (CLP Team Leader) and colleagues: Dairy farming, Goat farming, Milk Collection and Marketing through visiting milk collectors from the mainland
27.3.09	Dhaka City	Meeting and Discussion with Maj.Gen. Amjad Khan Chowdhury (Retd), Chief Executive of PRAN-RFL Group
30.3.09	Dhaka City	Gulshan-2 Market to talk to the retail trade on Milk and Milk Product marketing and to see the products on the shelves and prices charged
31.3.09	Dhaka City	Meeting with Mr. Mohammad Shah Alam Secretary MOFL, Mr.Md Shah Alam Siddiqui, Joint Chief, and others in the MOFL on the Mission's impressions and findings

Under the SIPP, about one quarter (or 116 villages) thus far received the first installment (50% of the total) from the SDF development fund to the extent of Tks. 2,500/beneficiary. The larger share of these resources (85%) is to be used for a revolving fund for Self Help Groups (SHGs); 15% is for institutional development and one-time transfers to extremely vulnerable people. The SIPP beneficiaries are identified jointly with the Gram Centre (the GB of the elected local self government) in the selected villages. All of them are poor, many of them extremely poor, almost all landless, with no assets and hardly any income. The SIPP arranges for them skill training, access to finance for asset building, and to an extent enables market access. The activities are diverse, based on the beneficiaries' preferences: fattening of beef cattle (male calves), goat farming, dairy farming mostly with indigenous cows, sericulture, backyard poultry (local birds - chicken and ducks), puffed rice making, rice de-husking, rice trading, grocery shop, tea shop, vegetable vending, investing in cycle rickshaws, bamboo trading, manufacture of rice cookies, rice parboiling for trade, and different skill trainings for livelihood (loans meeting the training fees and costs), all on loans made available to them from the revolving funds set up by the SIPP in their SHGs. Loan sizes are small (Tks. 4000 to 7000 per individual) repayable with interest over 44 weeks, at a substantial interest rate (interest is collected up front as a 10% service charge which translates into an annual interest rate of >20%). Several villagers expressed a keen interest in training activities; in their view the lack of skills (and capital as well) prevents them from migrating. Villagers demonstrated ample willingness to work together as a group.

None of the livestock related activity modules are scale adequate for enabling the beneficiary to build a livelihood around the activity, even though the potential exists; nor are the market linkages in place, input as well as output. All beneficiaries reported considerable improvements in the quality of their lives on account of the SIPP interventions: often meaning three square meals a day for the family, with incomes derived from the activity ranging between Tks. 100-150 per day. There are however considerable variations in the comfort levels depending upon the type of activity chosen by them: for example, those opting for dairy cows and goats have long incubation periods and gaps when cows go dry or while waiting for the goats to grow and be ready for the market. Only about 35 percent of beneficiaries are involved with livestock-related livelihood activities, clearly because of the unplanned activity modules, most of them which are open ended. With a basket of well planned livestock activities, it is likely that a lot more of the beneficiaries (possibly some 70 per cent) will opt for them as rearing livestock is part of their traditional livelihood and most of them have the basic skills required.

There are villages in the SIPP area where milk collection has already shown to be a viable option: collecting more than 100 liters per day and with the potential for steady growth in milk output (e.g., village "Uttar Rifayatpur" in Gaibandha district). But ideally livelihood building around milk production should be a well planned operation:

(i) Formation of a Common Interest Group (cum SHG for savings and credit) of dairy farmers;

(ii) Morning and evening milk collection at a central point in the village, every sample tested for fat, and price paid on the basis of fat delivered (required is a Manual Gerber's Test or an automatic electronic milko-tester: viable for operations of 100 liters/day of milk and above);

(iii) Linkage to a bulk milk cooler (BMC) or milk chilling plant, if one is available within accessible distance or a dedicated 2000 liter capacity bulk milk cooler (BMC) installed in the village (owned by the Common Interest Group as a community asset);

(iv) Development of a cluster of milk villages with BMCs like the start village to enable progressively viable milk collection volumes and for insulated tanker movement of chilled milk once daily or once on alternate days;

(v) Installing a trained livestock service provider in the village (one for each cluster) to home deliver basic preventive and curative veterinary care; and with skills for artificial insemination (AI) also (with exotic bull semen: Jersey or Holstein / Friesian<sup>13</sup>), home delivered to farmers as a paid input; and producing in the village progressively increasing numbers of high yielding dairy cows;<sup>14</sup>

(vi) Arrangements for daily retail sale of balanced cattle feed to the milk producers in the collection centre;

(vii) Contracting well-to-do farmers with irrigated land in the village to raise fodder crops (Hybrid Napier variety CO<sub>3</sub> mixed with the leguminous shrub hedge lucerne (*desmanthes virgates*) in alternate rows), to be cut and sold daily in the collection centre by the Common Interest Group. This fodder combination is a perennial high value crop with annual yields of some 200 MT per acre (at least 400 MT per ha) and can be cut every 21 days – cut daily in rotation starting from one end of the field – giving the fodder farmer daily cash income totaling at least Tks. 50000/year/ha.

### **Model Dairy Unit**

(i) The package for dairy as a livelihood activity should consist of two pregnant crossbred cows (if crossbred cows are not available then opt for well-grown indigenous cows) - pregnant and ready to calve soon – financed at an interval of six months. This will enable the beneficiary to have lactating cows throughout the year and will help him/her to manage the animals well and to repay the loan on a regular basis;

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<sup>13</sup> In places where AI is impractical, the project should arrange upfront a crossbred Holstein / Friesian breeding bull for natural service: maintained by a selected beneficiary as a livelihood option, providing paid services to other beneficiaries' cows. The bull should be a grant from the SIPP and the bull keeper should be provided with some maintenance subsidies for the first three years.

<sup>14</sup> Unlike popular wisdom, use of large exotic breeds for crossbreeding will not entail any gynaecological problems for the small indigenous cows at calving, as the calf will only be relatively big, i.e. its size and weight are conditioned by the maternal environment provided in the mother's womb. The after-birth growth and weight gain of the calf will of course significantly exceed those of traditional species, in proportion to its genetic architecture.

(ii) There should be an element of subsidy attached to the loan, as the beneficiaries are near destitute with no assets: a 60:40 proportion of grant to loan could be considered;

(iii) Promote dairy packages only in villages where milk collection is proposed and where BMCs are available in the village itself or in another village nearby;

(iv) The package should include installation of rotary hand-operated chaff cutters in the collection centre for the farmers to chop fodder daily: each centre should have 3 or 4 units, each costing only about Tks. 5000. This will maximize the use of the fodder while minimizing waste;

(v) There should also be the option for the beneficiary to seek support for a low cost shelter for the cows and manger (could be again on a 60:40 grant to loan basis) from the project, as it will help stall feeding and better management of the cows.

### **Model Goat Units**

Goats in Bangladesh are genetically small, mostly inherited from the most popular breed in the area (Black Bengal). However, there exist enormous opportunities to improve upon their body size and mature weight by upgrading them with larger breeds, thus doubling the meat output without affecting meat quality. The suggested choice donors are Sirohi or Barbari from the western trans-gangetic plains in the Indian subcontinent. A model package of support for goat rearing could include:

(i) A flock of one buck (preferably of a larger breed selected as donor for the project area) and five local does, enabling the beneficiary to sell at least five one-year old improved goats in a year;

(ii) The package should include one or two rotary chaff cutters to be owned by the CIG as community property, for the collective use of the goat CIG members;

(iii) Again a cluster approach may be promoted including services like (para)veterinary services and assistance with accessing markets;

(iv) Contracted fodder production by well-to-do farmers can be arranged in goat cluster villages too, using the same crops recommended for cattle and organized through the goat CIGs.

### **Model Poultry Units**

Poultry units are an attractive livelihood option even with local birds, fowl or duck. Rather than table eggs, the primary output of the unit is table birds born and brought up in the household backyard unit. One local hen can provide a minimum of ten table birds for the market per year resulting in earnings of at least Tks. 1000.



The model unit should be made up of ten local hens and two cocks. The unit should also include a wood and bamboo chicken structure with thatched roof for sheltering the birds at night.

The only input needed will be regular vaccinations against poultry diseases which can be delivered by a trained village housewife (provided with a vaccination kit) right in the village itself, if vaccines are made available to her on a regular basis by the DOLS or by the local partner NGO. Alternately vaccines can be stored in the BMC which has a standby generator, by just adding a mini fridge.

Another poultry model could be back yard poultry units with Kuroiler birds, a new mixed hybrid bird custom bred for the back yard system and made up of a crisscross of Indian jungle fowl Dalem Red, the indigenous fighting bird Peela Asil and Rhode Island Red, and developed by Kegg Farms Pvt Ltd in New Delhi, India. Unit size would be ten birds (mixed male and female). The birds are extremely sturdy and highly productive, able to reach a body weight of 2 kg at 6 months and producing 170 eggs (each of at least 60 grams) per year if managed well. They are foraging birds and will not incur overheads for management.

For the model poultry units a grant:loan ratio of 90:10 may be considered by the project.

As Kuroilers are hybrids they do not brood or hatch eggs; therefore the project has to develop brooder farmers to raise the company-supplied day-old chicks to 4 weeks of age. Brooder units cost about Tks. 20000 per beneficiary (brooder farmer) which could be financed under a 50:50 cost sharing scheme. The total number of units would be one per Upazilla, with a capacity of 2000 Kuroiler chicks per unit.

A local ducks unit should consist of ten birds (mix of ducks and drakes). The duck units will primarily sell eggs in the local market, but they will replace and expand their flocks by hatching duck eggs using the brooding hens in the household (ducks do not brood or hatch chicks).

Where relevant it is recommended to combine the backyard units for local fowl and duck together for a single beneficiary as there are many complementarities between the two.

### **Working Plan for Livestock-based Livelihood Options and Demonstration Units**

Based on the various model units as discussed above, the SIPP may consider preparing a comprehensive working plan for the livestock development, fodder production and livestock-based livelihood options, including costs, cost sharing methods, unit size and numbers, and time frame for implementation. The plan may then be shared with partner NGOs and other implementing agencies. The work plan may be circulated to all implementation teams of the SIPP. Some of the beneficiaries in the project area may be identified and their model units promoted as live demonstrations of the concept. One could think of model units of all species supported under SIPP, at the rate of two

demonstration units for each species per Upazilla, with special incentives for the identified beneficiaries for participating in the demonstration program.

### **Low Cost Technologies for feeding Fowl and Goat**

There exist a number of low (or nearly zero) cost technologies that can come in handy for supplementing the diets of local fowl and goat, and which are applicable throughout the Indian subcontinent:

(i) *Termite culture*: The most important of these is the culturing of termites. Termites constitute the natural feed of foraging local fowls and are very high-protein feed supplements. They can be cultured as follows:

Take a piece of old (but not toxic) gunny bag or thick cloth and soak it thoroughly in cow dung slurry. Place the soaked cloth against the outside wall of the house or hut in the open and cover it with an earthen pot. Soak the cloth once or twice with dung slurry at intervals of two or three days. In about a week time a thriving colony of termites will be established under the pot.

For one or two days feed the chicken with feed or grain offal around the pot and when the fowl are all in or around the pot open the pot for a few minutes. There will teeming termites in the colony trying to escape the sudden exposure and the fowl will eat them all up. Continue this practice two or three days and thereafter the fowl will all be ready near the pot waiting for it to be open for their feast.

Recharge the colony with small quantities of thick dung slurry once a week or so and the colony will thrive in spite of the daily onslaught of the fowl. Followed by many farmers in an area this could also be a significant measure of biological control of termites.

(ii) *Azola culture*: Azola is an algae like spirulina (the blue green algae used as a human protein supplement) and constitutes an excellent protein supplement for fowl, duck and even goat. Spores are available from Karnataka Agricultural University in Bangalore, India. The culture can be started as follows:

Make a rectangular pit of 3 ft x 2 ft x 3 ft and line it with building bricks (no need to use cement). Fill it with water and add a small quantity of powdered (in grits) groundnut cake. Two days later seed the water with Azola spores. In about two weeks the colony will establish itself and harvesting can be started during the third week. Top up the water until the level becomes stable. Harvest small quantities by hand initially and feed it straight to fowls and goats (30 grams per bird and 125 grams for goats). Ducks should be fed by soaking small strips of Azola in water and they will fish out the bits from the water as they feed in ponds (dose: 50 grams).

The colony will last several months and will yield up to 3 kg of Azola per day. When the colony shows signs of devitalisation, clean out the tank and reseed.

(iii) *Pod feeding*: Pods in all wild shrubs and trees are protein rich and can be used as feed for goat. Collect all pods available in any overgrown area and soak them overnight in mildly salted water. Hand-pound or crush the entire pods (do not throw away the shells) the next morning and feed them to goats (125 grams per head per day).

### **ANNEX 3**

#### **Suggested organization and functioning of a National Dairy Development Board**

The National Dairy Development Board (NDDDB) would function as the funding and promoting agency for dairy development in Bangladesh. It would be incorporated under the Societies Registration Act of Bangladesh and administered by the Charity Commissioner of Bangladesh (or any other appropriate Act & Authority) as per the provisions of the Act. The NDDDB would be totally autonomous and outside of the Government of Bangladesh with an accomplished Bangladeshi industry leader as its Chairman appointed by the Government. The NDDDB would be governed by a Board of Directors made up of stakeholder representatives from across the dairy industry nominated by the Government in consultation with the Chairman. The tenure of the Board and Chairman would be five years and premature removal of the Board, its Chairman or members will be subject to a judicial decree. The Board among other things would manage all dairy development funds in the country and appropriate such funds for dairy development in the cooperative sector as well as in the private sector in accordance with its Charter.

As its first act of commission it is suggested that the Board reviews the existing Cooperative Societies Act in Bangladesh and persuades the Government of Bangladesh to amend /modify the Act in a way that maximizes further development of the dairy sector. This particularly would involve removing the extraordinary powers that the Registrar of Cooperatives now enjoys, including the power to supersede the elected Board of Cooperative Societies, to interfere in the management and administration of Cooperative Societies, their merger or amalgamation etc. Such actions on a Cooperative Society should vest with the courts of law and judicial decrees and not with the Registrar of Cooperatives; the latter's mandate should be limited to registration of the Cooperative Societies and conducting cooperative audits directly or through qualified chartered accountants nominated for the purpose. Furthermore, it is suggested that the Act would also cease to have any ceilings on equity and dividends of Cooperative Societies. All these are necessary preconditions for the promotion of truly producer-owned cooperatives which can successfully carry on with the management and development of the dairy business, vertically integrating milk production, collection, processing and marketing from the village milk producer to the urban consumer, eliminating all middlemen en route.

## ANNEX 4

### Organization of Dairy Cooperative Societies

Proper organizing, planning and equipping newly established dairy cooperative societies (DCSs) is crucial for guaranteeing a steady supply of high quality milk to newly established dairy plants. It is therefore suggested that all newly to be promoted DCSs would have Milko-Testers or manually operated Gerber's Test equipment for testing the milk supplied by the members every day. Milk would be accepted and paid according to its fat content in all cases and on every single day.

The milk tester (person) would be trained as a veterinary first aid person and artificial inseminator, making first aid, minor veterinary services and artificial insemination available right in the village.

The DCS would contract well-to-do farmers with irrigated land and interested in crop diversification for high value crops (present day fodder crops are high value crops) to cultivate green fodder for cut and sale in the DCS, on a daily basis. The recommended crop mix consists of Hybrid Napier CO<sub>3</sub> variety along with Hedge Lucerne (*Desmanthes Virgates*, a leguminous shrub) to be planted in alternate rows and cut daily together with the Napier grass. If well managed, this irrigated crop will produce yields of 200 MT *Desmanthes Virgates* per year per acre, can be cut once in 21 days in rotation, is perennial and need be replanted only once in three years. The crop will be cut by the DCS members daily and will be sold in the DCS premises daily at the time of milk collection. The farmer would receive a daily cash income and a total net income of some Tks. 50000 per ha per year. Depending upon the demand the DCS may contract more farmers in the village so that every milk producer has access to fodder if and when needed. The necessary cultivars (grass root slips and legume seeds) can be obtained from Coimbatore Agricultural University, Tamil Nadu, India. The DCS would also install on its premises a battery of three or four hand operated / electrical rotary chaff cutters for chopping the fodder by the farmers.

The milk union would also persuade well to do farmers to establish grass / legume nurseries / seed farms, also as high value / high return enterprises, for regular and uninterrupted supply of cultivars to all districts and DCSs of the milk union.

The milk union would establish a frozen semen production station with a capacity to produce 500000 doses of semen annually and equip every single DCS with one static liquid nitrogen container for storage of semen and the AI kit for the inseminator in the DCS. This would include the semen lab, stalls for some 100 bulls (50 exotic HF / Jersey; 30 halfbred bulls and 20 buffalo bulls: Murrah / Nili Ravi / Jaffarabadi) with a small stand by liquid nitrogen plant for emergencies. Regular supply of liquid nitrogen for the semen station and the DCSs should be arranged through a liquid gas bulk manufacturer as the system has enormous economies of scale. The approximate cost of the station will be Tks. 20 million (about \$ 290,000).

The breeding plan for cattle will be crossing of indigenous cows with the selected exotic donor breed and then *inter se* mating of the halfbreds among themselves (halfbred male x halfbred female) perpetually in order to maintain the contributions of the two parents always at half and half: so that the generations of crossbred cows added to the population will have high yields inherited from the exotic Sire and endurance and survivability from the indigenous Dam. Genetic progress in the crossbred population will be ensured by the Milk Union by setting in motion a sire evaluation program using the AI Contemporary Comparison Method on a regular and continuing basis.

**ANNEX 5**  
**People interviewed during scoping mission**

**AFTAB Foods Limited**

- Joynal Abedin, Deputy Manager, Uttara Bank Bhabon (4<sup>th</sup>&5<sup>th</sup> Floor), 90 Mothjheel C/A, Dhaka-1000, Bangladesh

**Bangladesh Milk Producers' Co-operative Union Ltd. (Milk Vita)**

- Engr. M.N. Islam, General Manager I/C, Dugdha Bhaban, 139-140, Tejgaon I/A, Dhaka-1208, Bangladesh

**BRAC**

- Mohammad Mokarrom Hossain, Program Manager – Fisheries Enterprise, BRAC Enterprises. BRAC Centre, 75 Mohakhali, Dhaka-1212, Bangladesh

**CARE**

- Muhammad Nurul Amin Siddiquee, Project Coordinator, Strengthening Dairy Value Chain Project, Prgati RPR Center (11<sup>th</sup> Floor), 20-21, Kawran Bazar, Dhaka-1215, Bangladesh

**DFID**

- Roland Hodson, Team Leader, Chars Livelihoods Program (CLP), Rural Development & Co-operatives Division of MLGRD & C, Rural Development Academy (RDA) Campus, Sherpur, Bogra-5842, Bangladesh
- Md. Mozaharul Islam, Market Development Program Manager

**Grameen Fisheries and Livestock Foundation**

- Mohammad Ehsanul Bari, Managing Director. Grameen Fisheries and Livestock Foundation, Grameen Bank Complex, Mirpur-2, Dhaka-1216, Bangladesh
- A.K.M. Badrul Alam, Deputy General Manager. Grameen Fisheries and Livestock Foundation, Grameen Bank Complex, Mirpur-2, Dhaka-1216, Bangladesh
- Mohammad Akhter Hamid, Deputy General Manager, Joysagar Farm, Grameen Fisheries and Livestock Foundation, Nimgachi, Raigonj, Sirajgonj, Bangladesh.

**International Livestock Research Center**

- Mohammad Jabbar, Agricultural Economist, Dhaka, Bangladesh

**Katalyst – Partners in Business Innovation**

- James Blewett, General Manager, Swiss Contact. House 20, Road 6, Baridhara, Dhaka, Bangladesh.
- Fouzia Nasreen, Manager – Rural Sectors Division. Swiss Contact. House 20, Road 6, Baridhara, Dhaka, Bangladesh.

**Ministry of Fisheries and Livestock**

- Mohammad Shah Alam, Secretary. Ministry of Fisheries and Livestock, Building 6, Suite 509, Dhaka, Bangladesh.
- Parikshit Datta Choudhury, Joint Secretary. Ministry of Fisheries and Livestock, Dhaka, Bangladesh.
- Mohammad Shafiqul Islam, Deputy Secretary, Ministry of Fisheries and Livestock, Dhaka, Bangladesh
- Mohammad Rafiqul Islam, Director General. Department of Fisheries, Government of Bangladesh, Matshya Bhaban, Ramna, Dakha-1000, Bangladesh
- Sunil Chandra Ghosh, Former Director General (retired), Department of Livestock Services, Dhaka, Bangladesh
- Mohammad Abul Khair, Assistant Director. Department of Fisheries, Government of Bangladesh, Matshya Bhaban, Ramna, Dakha-1000, Bangladesh
- Muhammad Salehuddin Khan, Director General and Chief Veterinary Officer. Department of Livestock Services, Dhaka, Bangladesh

#### **PRAN-RFL Group**

- Maj Gen Amjad Khan Chowdhury (Retd), Chief Executive, Property Heights, 12 R K Mission Road, GPO Box # 83, Dhaka-1203, Bangladesh
- Md. Eleash Mridha, Executive Director
- Dr. Md. Rakibur Rahman (Rakib), D.V.M. (Sust)
- Ms. Uzma Chowdhury, CPA, Director

#### **SHISUK**

- Sakiul Millat Morshed, Executive Director, SHISUK. 7/1 Block A, Lalmatia, Dhaka, 1207, Bangladesh

#### **Social Development Foundation**

- Nazrul Alam Sarder, Manager, SDF Gaibanda
- M.U.M. Abdul Maleque, Consultant (Livelihood)

#### **United Nations Organizations**

- Mohammad Nuruzzaman, National Consultant – WID. Bangladesh Quality Support Program (Fisheries). UNIDO. BSTI Bhaban (3<sup>rd</sup> floor), 116/A Tejagon Industrial Area, Dhaka-1208, Bangladesh
- Ad Spijkers, FAO Representative in Bangladesh, Food and Agriculture Organization of the United Nations. House 37, Raod 8, Dhanmondi Residential Area, Dhaka, Bangladesh.
- El Zein M. El Muzamil, Senior Emergency Coordinator, Food and Agriculture Organization of the United Nations. House 37, Raod 8, Dhanmondi Residential Area, Dhaka, Bangladesh.
- Tommaso Alacevich, Associate Programme Officer, Food and Agriculture Organization of the United Nations. House 37, Raod 8, Dhanmondi Residential Area, Dhaka, Bangladesh.



**Winrock International**

- Mohammad Mokammel Hossain, Prawn Market Coordinator – Market Development Program. Winrock International, House 02 (1<sup>st</sup> Floor), Road 23/A, Gulshan-1, Dhaka 1212, Bangladesh

**WorldFish Centre**

- Alan C. Brooks, Regional Director – Bangladesh and South Asia Office. WorldFish Centre, House 22B, Road 7, Block F, Barani, Dhaka 1213, Bangladesh
- Mohammad Giasuddin Khan, Senior Fisheries Scientist. WorldFish Centre South Asia Office., House 22B, Road 7, Block F, Barani, Dhaka-1213, Bangladesh.
- Naseem Ahmed Aleem, Portfolio Coordinator, WorldFish Centre South Asia Office., House 22B, Road 7, Block F, Barani, Dhaka-1213, Bangladesh.