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Credit and microfinance needs in inland capture fisheries development and conservation in Asia

Cover photo:
Residents of the villages on the Tonle Sap Great Lake, Cambodia rely on fishing as their primary source of food and income. FAO/J. Thompson

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Preparation of this document

This document contains guidelines for meeting the credit and microfinance needs in inland capture fisheries development and conservation in Asia (Part 1); reports of the proceedings and recommendations of two regional workshops held in 2004 and 2006 from which these guidelines evolved (Part 2); and case studies and success stories on credit and microfinance in inland fisheries in Asia (Part 3). The case studies and success stories were drafted in 2004 and 2005 and formed the basis of the discussions at the second regional workshop. The lessons learned from case studies and success stories are incorporated in the guidelines.

This document was prepared by Uwe Tietze, consultant, FAO Fisheries and Aquaculture Department, and Susana V. Siar, Fishery Industry Officer, Gerd Marmulla, Fishery Resources Officer, and Raymon van Anrooy, Fishery Planning Analyst, of the Fisheries and Aquaculture Department of the Food and Agriculture Organization of the United Nations (FAO). The regional workshops were co-funded by the Fishing Technology Service (FIIT) and the former Inland Water Resources and Aquaculture Service (FIRI) of the FAO Fisheries Department.

The presentation of case studies and success stories in Part 3 of this publication is based on the study reports prepared by Xie Yingliang, Yan Xiaomei and Zhu Chengde of the East China Sea Fisheries Research Institute of the Chinese Academy of Fishery Sciences; P.V. Dehadrai of the Centre for Sustainable Aquaculture and Fisheries, India; M.A. Upare of the National Bank for Agriculture and Rural Development of India; Nu Nu Aye' of the Myanmar Agricultural Development Bank and Khin Maung Win' of the Department of Fisheries of Myanmar; Heng Sotharith of the Department of Fisheries of Cambodia, and Mahyam Mohd Isa of the Southeast Asian Fisheries Development Center and Jephrin Wong of the Sabah State Fisheries Department, of Malaysia.

Abstract

Recognition of the importance of microfinance as a crucial development tool for poverty reduction has increased during the last two decades. The United Nations, in its General Assembly Resolution 52/194, passed on 18 December 1997, noted that in many countries, microcredit programmes have succeeded in generating productive self-employment by providing access to small capital for people living in poverty as well as increased participation in the mainstream economic and political process of society.

This publication provides orientation, basic considerations and general principles for those institutions and organizations that provide credit and microfinance services to the fisheries sector, particularly the small-scale fisheries sector, and for those who want to include inland fishers and inland capture fisheries as part of their client base and lending operations. The publication also reaches out to the users of credit and microfinance services and to important stakeholders, including inland fisher associations and cooperatives; fisheries and other government departments and institutions concerned with the management, conservation and use of water bodies; local government authorities; and finally, individuals and groups of inland fishers and women in inland fishing communities.

The document has three parts. Part 1 contains guidelines for meeting the credit and microfinance needs in inland capture fisheries development and conservation in Asia. The guidelines highlight the need to conserve and manage inland fisheries and identify opportunities for inland fisheries development, conservation and financing. With special reference to the socio-economic characteristics of inland fisheries and inland fishers, lending policies and procedures suitable for financing inland fisheries are elaborated on. These include the identification of target groups and their credit and microfinance needs, loan sizes and loan purposes, interest rates and repayment periods, documentation and collateral requirements as well as savings and insurance services. Also discussed is the role of various stakeholders in providing financial services and in managing and conserving inland fishery resources, i.e. governments, NGOs, self-help groups (SHGs), fisher associations, financial institutions and donors.

Part 2 contains reports of the proceedings and recommendations of two regional workshops, from which the guidelines evolved. The first was the *Regional Workshop on Microfinance and Credit Programmes in Support of Responsible Inland Capture Fisheries Practices for Sustainable Use of Inland Fishery Resources*, held in Kuala Lumpur, Malaysia, 26-30 April 2004 and organized by the Intergovernmental Organization for Marketing Information and Technical Advisory Services for Fishery Products in the Asia Pacific Region (INFOFISH) in cooperation with the Fisheries Development Authority of Malaysia (LKIM), the Department of Fisheries of Malaysia, the Agricultural Development Bank of Malaysia and FAO. The second was the *Regional Workshop on Guidance for Credit and Microfinance Programmes in Support of Sustainable Use of Inland Fishery Resources and Poverty Alleviation*, held in Beijing, China, 14-17 February 2006 and jointly organized by the China Society of Fisheries, the East China Sea Fisheries Research Institute, the Chinese Academy of Fishery Sciences and FAO. Both workshops were supported by the Asia Pacific Rural and Agricultural Credit Association (APRACA).

Part 3 of the document consists of case studies and success stories on: the rehabilitation of inland fisheries and on the access to and utilization of credit and microfinance services with reference to the rehabilitation and development of inland fisheries at Lake Taihu and Lake Luoma in China; management challenges of riverine fisheries along River Ganga and prospects of inland fisheries development in West Bengal and Assam in India; livelihoods at Lake Inlay in Southern Shan State in Myanmar; fishery policy reform and aquaculture development in Cambodia; and community based rehabilitation and management of fishery resources at River Kinabatangan in Sabah, Malaysia.

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Executive summary

Recognition of the importance of microfinance as a crucial development tool for poverty reduction has increased during the last two decades. The United Nations, in its General Assembly Resolution 52/194, passed on 18 December 1997, noted that in many countries, microcredit programmes have succeeded in generating productive self-employment by providing access to small capital for people living in poverty as well as increased participation in the mainstream economic and political process of society.

This paper provides orientation, basic considerations and general principles for the institutions and organizations that provide credit and microfinance services to the fisheries sector, particularly the small-scale fisheries sector, and for those who wish to include inland fishers and inland capture fisheries as part of their client base and lending operations. This paper also reaches out to the users of credit and microfinance services and to important stakeholders, including inland fisher associations and cooperatives; fisheries and other government departments and institutions concerned with the management, conservation and use of water bodies; local government authorities; and finally, individuals and groups of inland fishers and women in inland fishing communities.

This paper has three parts. Part 1 contains guidelines for meeting the credit and microfinance needs in inland capture fisheries development and conservation in Asia. The guidelines highlight the need to conserve and manage inland fisheries and identify opportunities for inland fisheries development, conservation and financing. With special reference to the socio-economic characteristics of inland fisheries and inland fishers, lending policies and procedures suitable for financing inland fisheries are elaborated on. These include the identification of target groups and their credit and microfinance needs, loan sizes and loan purposes, interest rates and repayment periods, documentation and collateral requirements, as well as savings and insurance services. Also discussed is the role of various stakeholders in providing financial services and in managing and conserving inland fishery resources, i.e. governments, NGOs, self-help groups (SHGs), fisher associations, financial institutions and donors.

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The Kuala Lumpur Workshop identified the main threats to sustainable inland capture fisheries: the reduction of survival space and modification of habitat of fish and aquatic organisms; deforestation; pollution of water bodies and the aquatic environment; overfishing and destructive fishing practices; local conflict in management;

and utilization of migratory fish stocks and water bodies. Other main threats identified were the lack of capital needed for developing and rehabilitating inland fisheries, and related to this, the lack of awareness of financial institutions of the investment and credit needs of inland fisheries.

Other constraints to a proper and sustainable utilization of inland waters include: short-term leasing policies of open water bodies; inadequate conservation measures; inadequate and/or malfunctioning infrastructure for fish hatching and nursing; inadequate infrastructure for post-harvest handling and marketing; inadequate data on current and potential levels of exploitation of water bodies; inadequate financial assistance, investment support and credit supply to inland fisheries; and exploitation of fishers and primary producers by traders.

This workshop also identified measures that could be taken to overcome the constraints and move towards a sustainable use and rehabilitation of inland fishery resources. These include, *inter alia*: improving habitats in rivers, floodplains and other inland waters; facilitating fish migration through retrofitting dams with fish passes and by constructing appropriate fish passage facilities when new dams are built; conserving wetlands; training and socially mobilizing fishers and their associations; upgrading skills of extension workers; improving infrastructure for hatchery and nursery units, landing centres, transportation, marketing, cold storages and ice plants; and setting up effective microfinance programmes. Further measures include creating civil society organizations such as self-help groups (SHGs) and their federations to reduce the negative influence of traders and middlemen, and to increase active participation of inland fishers in the use and management of inland fishery resources; introducing insurance facilities for fisheries assets and life insurance facilities for fishers; improving access to investment credit and working capital credit facilities; and introducing long-term leasing policies for publicly owned open water bodies to encourage investment and sustainable development inputs and efforts.

The Beijing Workshop concluded that inland waters are important for food security, livelihoods and income generation of large populations in Asia, and biodiversity. They have many uses competing with each other; the fisheries sector, being one of them, has very little influence in decision-making on their use. Inland fisheries sector often receives insufficient attention in national fisheries policy frameworks and in general national development plans.

Rehabilitation of the inland aquatic environment for natural fish production should be done in conjunction with microfinance programmes, but microfinance alone would not solve the problem of poverty in fishing communities. Microfinance benefits the poor by increasing income-earning opportunities, securing livelihoods, decreasing vulnerability, and empowering beneficiaries, especially women. To date, microfinance for inland fisheries has been primarily directed towards aquaculture activities. Inland capture fisheries as well as processing and marketing of inland fisheries products have received little attention from microfinance schemes in the region.

A clear distinction should be made between inland capture fisheries and aquaculture. A monitoring system for microfinance and credit should be established that distinguishes between inland capture and aquaculture, and other subsectors. At present, it is not possible to measure the contribution of microfinance to improving the livelihoods of inland capture fishers.

In many Asian countries, it is still not easy for small-scale fishers to access credit. This is generally not a result of limited availability of funding, but of a lack of information on the needs of fishing communities. There is lack of awareness among fishing communities about microfinance services.

The Beijing Workshop provided recommendations to national governments, financial institutions, international agencies and donors, fishers and NGOs. The recommendations for national governments included: mainstreaming inland capture

fisheries into national economic development policy frameworks; developing fishery finance policy frameworks; rehabilitating and restoring the inland aquatic environment for natural fish production; improving water quality in parallel with microfinance; working towards compliance with and enforcement of international agreements and guidelines; and investing in infrastructure in support of inland capture fisheries production and post-harvest activities. The Workshop also recommended designing and implementing capacity-building and skill enhancement programmes for poor inland capture fishers.

Financial institutions were recommended to: establish a monitoring system for microfinance and credit disbursements that distinguishes between inland capture and aquaculture or other subsectors, to reach out to inland fishing communities and facilitate poor fishers' access to microfinance and insurance services; implement the guidelines for meeting credit and microfinance needs in inland capture fisheries development and conservation in Asia; and provide services that are tailored to the needs of poor inland fishers.

The Beijing Workshop recommended further that international/regional organizations, donor agencies and NGOs, *inter alia*, should: encourage financial institutions to make available loans to fishing communities and their associations for rehabilitation of fish habitats and fish stock enhancement; encourage and assist national governments to establish river basin commissions to ensure that institutional arrangements in all areas of the river under different administrative jurisdictions are consistent and non-conflicting; provide guarantee funds in support of the implementation of inland fisheries management measures. Further, the Workshop recommended to field-test the present guidelines and contribute to promoting capacity building and skills enhancement in microfinance for poverty alleviation and the sustainable use of inland capture fishery resources.

Fishers were recommended to organize themselves to take better care of their interests at all levels. Their organizations, associations and SHGs can function as financial intermediaries and guarantors of loans from microfinance institutions. Fishers should take responsibility for the sustainable management and well-being of inland fishery resources and fishers.

Part 3 of the document consists of case studies and success stories on: the rehabilitation of inland fisheries and on the access to and utilization of credit and microfinance services with reference to the rehabilitation and development of inland fisheries at Lake Taihu and Lake Luoma in China; management challenges in riverine fisheries along River Ganga and prospects of inland fisheries development in West Bengal and Assam in India; livelihoods at Lake Inlay in Southern Shan State in Myanmar; fishery policy reform and aquaculture development in Cambodia; and community-based rehabilitation and management of fishery resources at River Kinabatangan in Sabah, Malaysia. Some of the case studies contain proposals on aquaculture development that could be seen as a way to relieve pressure from inland capture fisheries. Appropriate microfinance and credit support for these proposals would probably have to come from specific aquaculture credit programmes.

Contents

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Acronyms and abbreviations

Agribank	Vietnam Bank for Agriculture and Rural Development
ADB	Asian Development Bank
APRACA	Asia Pacific Rural and Agricultural Credit Association
AFDC	Assam Fisheries Development Corporation
APIP	Agricultural Productivity Improvement Project
BAAC	Bank for Agriculture and Agricultural Cooperatives
BLBC	Block Level Bankers' Committee
BPM	Bank Pertanian Malaysia
BRI	Bank Rakyat Indonesia
CBD	Convention on Biological Diversity
CBRM	Community-based resources management
CCRF	Code of Conduct for Responsible Fisheries
CO	Community organization
DANIDA	Danish International Development Agency
DCCB	District Central Cooperative Bank
DoF	Department of Fisheries
DFID	Department for International Development of the United Kingdom
DLCC	District Level Co-ordination Committee
DRDA	District Rural Development Agency
FAO	Food and Agriculture Organization of the United Nations
FishCopFed	Fisheries Cooperatives Federation
FIIT	FAO Fishing Technology Service
FISHFED	Fish Marketing and Processing Federation Limited
FMC	Fisheries Management Committee
GDP	Gross domestic product
GLC	Ground level credit
GOI	Government of India
GPS	Global positioning system
GRET	Groupe de Recherche et d'Échanges Technologiques (Research and Technological Exchange)
HDI	Human development initiatives
HP	Horsepower
ICAR	Indian Council of Agricultural Research
ICLARM	International Center for Living Aquatic Resources Management
IDR	Indonesian Rupiah
IFAD	International Fund for Agricultural Development

INFOFISH	Intergovernmental Organization for Marketing Information and Technical Advisory Services for Fishery Products in the Asia Pacific Region
INR	Indian Rupee (INR1=US$0.021594[1])
IRRI	International Rice Research Institute
IUU	Illegal, unregulated and unreported fishing
Ko-Nelayan	Sabah Fisheries and Fishermen's Development Corporation
Kyat	The basic unit of currency in Myanmar (Kyat1=US$0.171869)
LKIM	Fisheries Development Authority of Malaysia
MADB	Myanmar Agricultural Development Bank
MEB	Myanmar Economic Bank
MFI	Microfinance institution
MFIS	Microfinance institution system
MIS	Management information system
MWAF	Myanmar Women's Affairs Federation
MMCWA	Myanmar Maternal and Child Welfare Association
MWEA	Myanmar Women Entrepreneurial Association
MLFDB	Myanmar Livestock and Fisheries Development Bank
MRC	Mekong River Commission
NACA	Network of Aquaculture Centres in Asia-Pacific
NABARD	National Bank for Agriculture and Rural Development
NAP	National agricultural policy
NCDC	National Cooperative Development Corporation
NGO	Non-governmental organization
PACS	Primary agricultural cooperative society
PENGASAH	Persatuan Nelayan Negeri Sabah
ppm	Parts per million
pH	Power (or potential) of hydrogen
RM	Malaysian Ringgit (RM1=US$0.263142)
RRB	Regional rural bank
SAFMA	Sabah Fish Marketing Sdn. Bhd.
SEAFDEC	Southeast Asian Fisheries Development Center
SGSY	Swarnajayanti Gram Swayamrojgar Yojana
UN	United Nations
UNDP	United Nations Development Programme
UNGA	United Nations General Assembly
UNOPS	United Nations Office for Project Services
UP	Uttar Pradesh
US$	United States dollar
VND	Vietnamese Dong
WENFISH	West Bengal Fishermen's Cooperative Federation

[1] The reference date of this and other currency conversions is 1 September 2004.

PART 1

Guidelines for meeting credit and microfinance needs in inland capture fisheries development and conservation in Asia

1. INTRODUCTION

Recognition of the importance of microfinance[1] as a crucial development tool for poverty reduction has increased during the last two decades. The United Nations, in its General Assembly Resolution 52/194, passed on 18 December 1997, noted that in many countries, microcredit programmes have succeeded in generating productive self-employment by providing access to small capital to people living in poverty as well as in increasing participation in the mainstream economic and political process.

The Resolution welcomed the launching of different microcredit initiatives and acknowledged their important contribution to poverty eradication, empowerment of women, and social advancement. It called upon the relevant organs, organizations and bodies of the UN system, in particular, its funds and programmes, to explore the inclusion of the microcredit approach in their programmes as a tool for poverty eradication and for further developing other microfinance instruments.

The following guidelines are based on the discussions held in two regional workshops. The first is the *Regional Workshop on Microfinance and Credit Programmes in Support of Responsible Inland Capture Fisheries Practices for Sustainable Use of Inland Fishery Resources*, held in Kuala Lumpur, Malaysia, 26-30 April 2004 (the Kuala Lampur Workshop), and organized by the Intergovernmental Organization for Marketing Information and Technical Advisory Services for Fishery Products in the Asia Pacific Region (INFOFISH) in cooperation with the Fisheries Development Authority of Malaysia (LKIM), the Department of Fisheries of Malaysia, the Agricultural Development Bank of Malaysia and FAO. The second is the *Regional Workshop on Guidance for Credit and Microfinance Programmes in Support of Sustainable Use of Inland Fishery Resources and Poverty Alleviation*, held in Beijing, China, 14-17 February 2006 (the Beijing Workshop), jointly organized by the China Society of Fisheries, the East China Sea Fisheries Research Institute, the Chinese Academy of Fishery Sciences and FAO. The guidelines are also based on the case studies and success stories from the participating countries presented at the Beijing Workshop. The Asia Pacific Rural and Agricultural Credit Association (APRACA), with the strong personal support of their Secretary-General, was an active partner in conducting both workshops and in preparing the guidelines.

These guidelines are complementary to the FAO *management guidelines on revolving loan funds and credit programmes for fishing communities,* (Dorsey, Ryhanen and Tietze, 1989) and to the *FAO guidelines on microfinance in fisheries and aquaculture* (Tietze and Villareal, 2003).

2. PURPOSE AND TARGET GROUP OF GUIDELINES

These guidelines provide orientation, basic considerations and general principles for the institutions and organizations that provide formal credit and microfinance services to the fisheries sector, particularly the small-scale fisheries sector, and for those who wish to include inland fishers and inland capture fisheries as part of their client base and lending operations. The guidelines can be used by public and private financial institutions and other agencies providing financial and related services, including insurance, and by NGOs and donor agencies.

The guidelines also reach out to the users and target groups of credit and microfinance services and to important stakeholders. These stakeholders include inland fisher and fish producer associations and cooperatives; fisheries and other government departments and institutions concerned with the management, conservation and use

[1] There are a number of Web sites devoted to microfinance, such as: the International Year of Micro Credit 2005 at www.yearofmicro credit.org; the Rural Finance Learning Center at www.ruralfinance.org; the United Nations Capital Development Fund (UNCDF) Microfinance at www.uncdf.org; and the Microfinance Gateway at www.microfinancegateway.org.

of water bodies; local government authorities; and finally, to individuals and groups of inland fishers and women in inland fishing communities.

Like other guidelines, these should not be followed blindly, but rather be creatively adapted to the various circumstances and situations that prevail in different countries and geographic regions. In this way, they will contribute to the ultimate objectives – access of inland fishers and fisheries to viable credit and microfinance services in support of ecologically balanced and sustainable inland fisheries development and conservation, as well as to poverty alleviation in inland fishing communities.

3. BASIC CONSIDERATIONS

Prior to designing credit or microfinance policies or programmes that cater to inland fishers and fisheries, the ecological and economic importance of the sector needs to be considered together with the socio-economic characteristics of the stakeholders. The impact and sustainability of credit and microfinance operations depend on crucial factors that need to be identified, for which information, both quantitative and qualitative, needs to be compiled at the local level.

When secondary information is not available, primary data need to be collected and inland fisheries profiles need to be prepared that address, verify, and wherever possible, quantify the aspects for a given geographic area, as described below.

3.1 Inland fishery resources development and management

Inland fisheries in Asia and elsewhere make a very important contribution to food security, employment and generation of income, particularly in rural areas and for low-income sections of the population. In 2003, global inland fisheries production reached 34.2 million tonnes and accounted for 25.8 percent of the global fish production, of which 8.9 million tonnes, or 6.7 percent, were contributed by inland capture fisheries, and about 25 million tonnes, or 19 percent, by aquaculture.

Considering the percentages, inland capture fisheries production seems to be comparatively low. When looking at the local scale, however, it becomes clear that inland capture fisheries is very important for a vast segment of the rural and poor population since they contribute directly to the daily food supply. Also, when looking at the 6.7 percent share of inland capture fisheries production, it must be taken into consideration that figures for landings of inland capture fisheries are sometimes difficult to obtain, and in many cases, likely underestimated. This is also the case for studies on fish consumption based on household surveys, which suggest that the figures for inland fisheries production can be two to three times higher than are reported in official catch statistics.

In the case of inland capture fisheries, almost half of the global production in 2001 came from eight Asian countries and about a quarter from China alone.

There are diverse inland waters of importance for fisheries, including open river systems that are greatly influenced by annual variations in rainfall and host a large number of fish species; lakes that are less influenced by short-term climatic effects and have a smaller variety of fish species; and reservoirs that have the characteristics of both rivers and lakes.

In accordance with the Code of Conduct for Responsible Fisheries (FAO, 1995), states and users of living aquatic resources have the obligation to ensure their effective conservation and management.

Current fisheries management regimes have generally three components: fisheries management through the regulation of fishing and other human activities; fish management through stocking and introduction of species; and environmental management. The latter includes negotiating and arranging for adequate environmental conditions and promoting physical improvements to enhance the support capacity of the environment for fish.

Fisheries management should further promote the maintenance of the quality, diversity and availability of fishery resources in sufficient quantities for present and future generations to enhance food security, alleviate poverty and contribute to sustainable development. The promotion of economically viable fishery activities and enterprises that generate sustainable employment and income are an important element in this endeavour.

In the case of inland fisheries (FAO, 1997) the primary responsibility for the management of the aquatic environment usually falls outside fisheries authorities, and fisheries' interests and concerns are often peripheral to policy-making. It is important to integrate fisheries with other uses of water bodies such as energy generation, irrigation and navigation.

In most inland waters, principal constraints on the system and its living components come from human activities other than fishing. In the case of rivers and lakes, for example, construction of dams and channels, loss of lateral connectivity through loss of floodplains, and siltation pose threats to fish production and livelihoods of rural populations. Government at all levels, from central to local authorities, should set up mechanisms to conserve living aquatic resources that are compatible with the sustainable use of basins and aquatic ecosystems for the whole range of economic and social purposes. It should be kept in mind that conservation is always less expensive and more economical than rehabilitation or restoration.

The situation in Asia

Inland fishery resources in Asia are noted for their variety, biodiversity, rich ecological heritage and production potential. Rivers and floodplains are the prime source of fish germplasm and thus crucial to the conservation of fish biodiversity. Millions of fishers and their families depend on rivers and floodplains for their livelihoods. The present level of fish production from inland waters is below potential, in many cases due to low priority given to the sector by governments and investors. Little is known about the financial and economic performance of different inland fisheries in Asia and more studies need to be done at the regional level.

Commodities from freshwater inland fisheries play an increasingly important role in the regional trade of fish and fish products. The commercially most important products are made from catfish, freshwater prawn, carp, tilapia and eel. Little information is available, however, on marketing channels of inland fishery products and on consumer demand and preferences. There is a need for marketing research at the international, regional and domestic level with a special focus on inland fishery products.

The main threats to sustainable inland fisheries in Asia are: the reduction of survival space and the modification of habitat of fish and aquatic organisms; deforestation; pollution of water bodies and the aquatic environment; overfishing and destructive fishing practices; and local conflicts in the management and utilization of migratory fish stocks and water bodies. Other main threats are the lack of capital needed for the development and rehabilitation of inland fisheries, and related to this, the lack of awareness of financial institutions of the investment and credit needs of inland fisheries.

Other constraints to proper and sustainable utilization of inland waters include: short-term leasing policies of open water bodies; inadequate conservation measures; inadequate infrastructure for fish hatchery and nursery activities and post-harvest handling and marketing; inadequate data on current and potential levels of exploitation of water bodies. Further constraints are inadequate financial assistance, investment support and credit supply to inland fishers, and the exploitation of fishers and primary producers by traders.

Opportunities for inland fisheries development, conservation and financing

In general terms, possible measures to overcome the constraints and move towards the sustainable use and rehabilitation of inland fishery resources are:

- improving habitats in rivers, floodplains and other inland waters;
- facilitating fish migration through retrofitting of dams with fish passes and by constructing appropriate fish passage facilities when new dams are built;
- conserving wetlands;
- training and socially mobilizing fishers and their associations;
- creating civil society organizations such as self-help groups (SHGs) and their federations to reduce the negative influence of traders and middlemen, and to promote active participation of inland fishers in the use and management of inland fishery resources;
- upgrading skills of extension workers;
- improving infrastructure with regard to hatchery and nursery units, landing centres, transportation, marketing, cold storages and ice plants;
- promoting effective microfinance programmes and institutions, and improving access to investment credit and working capital credit facilities;
- introducing insurance facilities for fishery assets and life and health insurance facilities for fishers; and
- introducing long-term leasing policies for publicly owned open water bodies to encourage investment and sustainable development inputs and efforts.

3.2 Socio-economic characteristics of inland fisheries and inland fishers

Inland fishers (Welcomme, 2001) are far from a homogeneous group. In Asia, most inland fishers belong to the rural poor and are indebted to middlepersons and moneylenders. While some inland fishers own their fishing gear and craft, most work on a share basis or as labourers. In some areas, there is an open access to inland water resources, but there is an increasing tendency to limit access to these previously open resources and charge fees for access through leases and licences. Often, entrepreneurs and local businessmen acquire the fishing rights and levy a charge on fishers, in cash or kind, or employ them to fish for them.

Inland fishers can be subdivided according to how they use the resource. Full-time fishers are one of the smaller stakeholder groups dependent on inland capture fisheries. They are found in or around larger water bodies where there are sufficiently large quantities of commercially valuable fish year round. Full-time fishers may also seasonally migrate between a number of different habitats or river sections. The livelihoods of full-time fishers depend greatly on the profitability and the yield of the fishery as their only or major source of income. Most of the catch of full-time fishers is sold for cash, while a part might be retained for family consumption.

Many inland fishers are part-time and occasional fishers who have other important sources of income, such as agriculture, urban labour or transport. A part of their catch is usually sold for cash while another part is retained for family consumption. Such fishers may also depend greatly on the profitability of the fishery since this is likely to determine the percentage of the time they allocate to fishing. In the case of fishers who are also farmers, fishing is usually practised during the season when no planting or harvesting needs to be done.

Subsistence fishers mainly fish to supplement the family diet during slack periods in their daily schedules or seasonal calendars. Subsistence fishing in inland waters can be a last-resort occupation for the landless, the widowed, women and children.

Recreational fishers do not normally depend on inland fisheries for employment, income or food, but enjoy fishing as a temporary pastime. Recreational fisheries are defined here as "fisheries conducted by individuals primarily for sport but with a possible secondary objective of capturing fish for domestic consumption but not for onward sale" (FAO, 1997). Recreational fishers are often external to the rural milieu where they practise their sport. They can provide important contributions to fish and habitat conservation. Concern of recreational fishers with the fishing habitat is driven

by a desire to protect the characteristics that they value. However, recreational fisheries can also damage commercial fish stocks through the loss of gear and catching breeding fish. In inland waters they provide employment and income to hundreds of thousands of people throughout Asia. Recreational fishers in Asia spend considerable amounts of money for their fishing activities on fishing tackle, fishing permits, harvest charges, boats, travel and accommodation. Economically viable activities that support the sustainable development of recreational fisheries and aim at reducing conflicts between recreational and commercial fishers should be eligible for microfinance and credit support.

Other stakeholders involved in inland fisheries derive their livelihoods from either side of the fishery: upstream, by supporting or providing inputs to catching activities; or downstream, by being part of the supply chain between fisher and ultimate consumer. In Asia, the same individual can be involved both upstream and downstream as supplier and manufacturer of inputs and infrastructure, formal or informal financier of fishing, fish processor, transporter, wholesaler, trader and/or retailer, as well as in other functions.

4. LENDING POLICIES AND PROCEDURES

Credit and microfinance should be supported by effective measures of government authorities and other stakeholders that aim to reduce poverty through improved inland capture fisheries management, conservation and fishery resources enhancement. This requires a better integration of fisheries development within an overall ecosystem and a rural development approach, as well as the adoption of a precautionary approach. Financing institutions and funding agencies should support development projects only on the basis of sound environmental impact assessments that take into due consideration fisheries management, and conservation needs and interests.

Cooperation and coordination between the fisheries and other sectors concerned with rural development and water resources management need to be enhanced, and stakeholders from the fisheries sector need to be involved at the earliest possible stage to ensure the long-term benefits of credit and microfinance interventions. Further, there is a need to consider the social and economic benefits of fisheries on a local scale and for improved fisheries data collection and dissemination for better planning of fisheries development in order to better target and tailor credit and microfinance programmes to local needs and requirements.

While the selection of target groups for microfinance programmes in inland fishing communities should be based on poverty and income levels of households, the consideration of poverty and income levels to be used as eligibility criteria should be dependent on country and local contexts.

4.1 Target groups and their microfinance and credit needs

Microfinance is needed in inland capture fisheries, particularly by poor households in fishing communities. Experiences of microfinance institutions have shown that there is a demand for savings and credit services among the poor that is rarely met because they do not have access. Experiences show that when the poor do get access to credit and microfinance services, they are able to save and repay their loans. Microfinance should help these households increase their income from fisheries activities and their general income-earning capacity through the promotion of other income-generating activities and micro-enterprises, both inside and outside the fishery sector, to be undertaken by household members. Microfinance support to inland fishing households should further support urgent consumer and other social needs related to their quality of life and smoothen consumption patterns, particularly during lean and off-seasons when little or no income or food is generated. Microfinance should help in managing risks better and reducing economic and social vulnerability by promoting mutual insurance, assistance mechanisms and other means.

Microfinance should assist and empower women, in particular, in inland fisheries. Women play an important role in inland fishing communities, which includes social and economic responsibilities and duties, both within and outside their households. They are directly involved in fish capture and culture, fish processing and marketing, as well as in livelihood activities other than fisheries that are important for augmenting household income during periods of scarcity and seasonality often experienced in inland fishing communities. Their involvement in microfinance often not only benefits them personally, but also their households and communities.

Since demand for financial services in inland fisheries is diverse, microfinance is only one of the means to meet this demand. Characterized by small loans and short lending periods, microfinance has inherent limitations when it comes to financing capital investments that need to be undertaken in the inland fisheries sector. These investments are necessary for growth and development, and most importantly, for the promotion of sustainable and environmentally sustainable fishing, fish processing, management and conservation practices and regimes, which are essential for the overall health of inland fisheries.

Target groups for credit in inland fisheries should include: individuals and groups of inland fishers in inland fishing communities, particularly women; inland fisher and fish producer associations; fish seed and feed producers; fish traders; fisheries and other government departments and institutions concerned with the management, conservation and use of water bodies; local government authorities; and NGOs.

The medium- and long-term credit needs of inland fisheries are generally for the purposes of:

- modernization and replacement of fishing craft and gear through acquiring ecologically sustainable and economically viable production inputs;
- navigational and safety equipment;
- equipment for on-board preservation and handling of catch;
- small- and medium-scale fish processing equipment and facilities;
- fish transportation and marketing facilities;
- fish product development and value addition;
- establishment and modernization of hatcheries and nurseries;
- small infrastructure works such as landing places or wharfs.

In addition to providing microfinance and credit for traditional and innovative production-oriented investments in the inland capture fishery sector, financial institutions, including governments and international funding agencies, may consider providing funds for project components designated for habitat conservation or improvement and for related research activities. Medium- and long-term credit should also be provided to: producer associations, and fisheries and other government departments and institutions concerned with the management, conservation and use of water bodies; local government authorities, NGOs and other bodies for investments into inland capture fishery enhancements through:

- introducing appropriate new fish and other aquatic species;
- stocking indigenous species in open aquatic environments;
- engineering the environment through shelter and habitat creation;
- constituting an artificial fauna of selected species;
- eliminating invasive species;
- fertilizing waters to raise productivity;
- modifying water bodies;
- conducting macro- and micro-economic and financial feasibility and valuation studies of inland fishery enterprises and of habitat and fisheries-related activities;
- conducting marketing research for inland fishery products in both domestic and export markets;
- establishing monitoring control and surveillance schemes;

- setting up initial implementation phases of inland fisheries management schemes based on cost-recovery.

4.2 Loan size and purpose

Loan amounts should be solely based on the purpose of the loan, the borrowers' debt and absorptive capacity, and on the regulations followed by a given financial intermediary. Underfunding of credit and investment needs should be absolutely avoided since it can very negatively affect investment profitability. Loans should not be limited to fisheries-related activities only, but include other livelihood opportunities available to members of the inland fishing community. The guiding criteria for both fishery and non-fishery projects should be their viability, sustainability and profitability, as well as their contribution to the long-term conservation and enhancement of inland fishery resources.

As can be seen from the credit and microfinance needs listed above, a very wide variety of loan sizes can be expected, ranging from very small loans related to small-scale fish trading, to medium-sized loans related to the purchase of fishing craft and gear, to very large loans related to shelter and habitat creation and the modification of water bodies.

In the case of microfinance, lending usually starts with small loans, including those for social and consumption needs, which gradually increase based on the repayment performance of the borrower.

4.3 Interest rates, lending procedures and repayment periods

As with other rural credit and microfinance operations, interest rates should be market-oriented in order to promote the development of economically and financially viable enterprises that would be sustainable in the medium and long term. The use of market-oriented interest rates also supports the emergence of healthy and viable financial institutions and intermediaries, which can service inland fisheries clients in the long term.

As for other rural sectors, lending procedures for inland capture fisheries should be flexible, timely and demand-oriented. Time taken for processing of a loan application should be kept to the minimum and loans should be disbursed when the funds are actually needed, for example, at the beginning of a particular fishing season to maximize investment profitability.

Loan repayment periods and frequency of loan repayments should be based on the borrower's cash flow. In the case of capture fisheries and capture fisheries-based marketing and processing activities, no or only small amounts of repayment should be scheduled during lean and off-seasons, while repayment should be scheduled at regular intervals during fishing seasons.

In the case of all production-related loans, loan repayment periods should be related to the amortization period and cash flow of the investments, and should be kept as short as possible to keep the amount of interest to the minimum. Early repayment of loans should be encouraged and incentives devised.

A wide variation of loan repayment periods is recommended in accordance with the various purposes for which loans are required and used in inland fisheries. In the case of microfinance and small-scale fish processing and vending activities, short-term loans to be repaid in less than one year might be appropriate, while most capital investment loans for acquiring fishing boats or fish processing facilities and equipment may be considered medium-term loans with repayment periods from three to five years. Loans for the establishment of hatcheries, the modification of water bodies and construction of fish passes depend on the amount of funds involved, and the amortization period may be considered long-term loans with repayment periods of more than five years.
With a view to ensure the proper use of a loan for the intended purpose as well as

timely repayment, it is recommended to follow a loan supervision schedule. The loan supervision schedule should be mentioned in the loan agreement. Depending on the type of loan and the borrower, different time intervals and methods of monitoring may be followed and different institutions may be involved. In the case of loans to local or federal governments, and loans for habitat improvement of rivers, floodplains and other inland waters, for example, the occasional monitoring of loan recovery records might be sufficient. In the case of microfinance programmes for inland fishers, however, regular field visits for the supervision of loan use may be necessary, which offer an opportunity to establish close contact with borrowers and to jointly identify and solve any problems that might arise.

As in other loans, in case of non-repayment of inland fisheries loans, it needs to be determined whether the borrower is genuinely unable to repay the loan or whether it is a case of willful default. In the latter case, if the borrower cannot be convinced to resume repayment of the loan, the financial institution will have to send reminders and then take legal steps according to their normal procedures. In case of genuine default, for example, due to an accident, failure of a fishing season, or a natural calamity, it needs to be examined whether it is possible for the borrower to resume a profitable fishery enterprise. Additional credit can be provided for this purpose and the outstanding repayment of the present loan can be rescheduled. Technical advice from the fisheries department and other fishery entrepreneurs should be obtained before decisions are made.

4.4 Documentation and collateral requirements

Generally, documentation and collateral requirements in microfinance and rural credit operations involving inland fishing communities should be kept simple. The documents to be completed and maintained should be sufficient to properly appraise requests for loans and financial assistance, both technically and financially, assess the repayment capacity and willingness of the borrower, and monitor and supervise loan use and recovery. (Examples of forms may be found in Tietze and Villareal, 2003 and Dorsey, Ryhanen and Tietze, 1989.) Documents include:

- a loan application document with all essential biographical and residential information of the borrower; the requested amount and purpose of the loan; the size and characteristics of the household and its assets, including non-fisheries assets, and all sources of monthly household income and expenditure; information on any outstanding debts of the household and its members; and on the sources from which the loan is intended to be repaid;
- in the case of loans for productive fisheries and non-fisheries activities, a simple business/production plan with physical and financial details of the planned investment and the anticipated project costs and earnings, including cash flows to be attached to the loan application;
- a loan agreement that clearly specifies the loan amount, the conditions under which the loan is to be disbursed, used and repaid, and all responsibilities and privileges of lender and borrower;
- a simple technical and financial appraisal form of the loan request, which justifies the acceptance or rejection of a loan request;
- other documents and records to be maintained by financial institutions, such as account ledgers, books of receipts, credit and savings registers, passbooks/vouchers, and borrowers' files.

The technical and financial viability of the proposed activity and the repayment capacity of the borrower should be the main consideration when approving or rejecting a loan request.

As far as the use of collaterals is concerned, a flexible mix of collaterals is suggested, which could include a hypothecation of the production assets supplied on credit, lease deeds of water bodies, fishing licences, insurance cover and other collaterals. In the

case of microfinance for inland fishing communities for both groups and individuals, group guarantees and third party guarantees of other microfinance beneficiaries should be accepted as collateral.

4.5 Savings and insurance services

Many inland fishing households save to reduce their vulnerability from natural calamities and other emergencies in lean or off-seasons, and for investment. These households have a demand for secure and convenient institutional savings and deposit services. Savings facilities should be offered to households that do not yet save in order to encourage the development of savings habits. Savings facilities and programmes should meet the following criteria:

- have flexible collection arrangements set up in terms of savings amounts, place and time;
- support savings education and motivation programmes and focus on strategies and benefits of savings and features of savings products;
- include savings products such as savings for health and life insurance, housing and education of children;
- have accountability, control and trust built into the savings mechanisms.

Voluntary savings programmes can also be included in the context of microcredit programmes, where they act as collateral and a pre-condition for receiving a loan, an element of risk management within groups of borrowers, and a tool for learning financial discipline and planning.

Insurance can be regarded as an effective risk management tool for financial institutions and organizations providing microfinance and credit services. Unfortunately, insurance services are not available to most inland fisheries in Asia. In countries where insurance services are available, they can help reduce the risks for financial institutions that provide credit for investment and productive purposes to the inland fishery sector. In such cases, one of the conditions or requirements for accessing credit may be having an insurance policy, which may then act as loan collateral.

5. INSTITUTIONAL ARRANGEMENTS

Close cooperation between all stakeholders, local management authorities, NGOs, government bodies and financial institutions responsible for financing agriculture and fisheries is crucial to counter the threats to inland waters and fisheries and take advantage of opportunities for sustainable inland fisheries development, conservation and financing.

5.1 The role of governments

Governments – fisheries departments, local government authorities, natural resources departments, government agencies responsible for ecology, environmental protection and other concerned government agencies – should cooperate to create an enabling legal and regulatory framework for the development and conservation of inland fisheries. Among other things, this framework should include: suitable fishing and fish farming regulations; the establishment of fish sanctuaries for the conservation of biodiversity; conducive land use planning, zoning and waste disposal regulations; environmental protection regulations; and appropriate leasing policies for public water bodies that facilitate access of inland fishers and their associations to fishery resources. The framework should also include regulations for a community-based management or co-management scheme for inland fisheries and water resources that allow for the participation of inland fishers and other stakeholders.

The creation of a fishery finance policy framework, which could be part of a larger rural and agriculture finance policy framework, is important to enable the sector to efficiently and effectively access financial resources. Inland fishers are affected by

different policy domains, including macroeconomic, financial sector, and fisheries sector policies. A successful fisheries financial policy framework could help integrate the various policy domains at the national level to provide the best possible support to the sector. Governments have a leading role to play in this area, while the views of all relevant stakeholders should be taken into proper consideration. A regulatory mechanism should be formulated whereby NGOs can transform themselves into microfinance institutions.

Government is also called upon to provide adequate infrastructure for inland fisheries development and conservation, particularly in rural areas. Among other things, this includes the construction of rural roads, supply of electricity, water and providing solid waste disposal facilities as well as public works and investments regarding shelter and habitat creation, modification of water bodies, and the construction and operation of hatcheries, nurseries and fish landing sites.

Governments, particularly their fisheries departments and inland fisheries research and extension units, should actively demonstrate and promote improved and responsible inland fisheries practices. Together with government agencies that promote the development of vocational skills, small- and medium-scale enterprises, and with financial institutions, they should assist inland fishing communities in the formation of SHGs and associations in order to improve the economic performance of their fishery enterprises and to alleviate poverty.

With regard to credit and microfinance, government agencies such as fisheries extension services should assist fishers and financial institutions in the identification of credit needs and of sustainable and viable inland fishery enterprises. They should further assist in the technical appraisal of loan applications and in the supervision of loan use as far as technical aspects of inland fishery enterprises are concerned.

5.2 The role of NGOs

NGOs can play a crucial role in all capacity-building and training aspects related to: community-based management of inland fishery resources; the formation and operation of SHGs and producer associations; the management of microfinance programmes, as well as in technical training related to the development of small and medium-scale fishery enterprises. This role should include preparing training of trainers' programmes and materials, implementing training programmes, and providing marketing assistance to SHGs and associations, such as organizing buyers and sellers meetings.

NGOs can also play a role as financial intermediaries and outreach organizations between fisher associations, SHGs and microfinance institutions. Considering the dominant role of women in marketing and post-harvest activities, NGOs should promote their cause in inland fishing communities.

In the absence of adequate government extension services, NGOs can play a crucial role as disseminators of technical knowledge at the village level. Technical personnel of fisheries departments and fisheries research and training institutes may train members and personnel of NGOs on fish breeding and rearing technologies, fish farm management, and various aspects of project formulation and implementation.

Specialized NGOs that have established themselves or that have been transformed into microfinance institutions (MFIs) are at the forefront in the development of microfinance schemes. They play crucial roles in designing, testing and disseminating innovative microcredit services, products and technologies. Some NGOs are officially registered as regulated financial institutions and perform the same services as banks.

In the promotion of inland fisheries development, conservation and poverty alleviation in inland fishing communities, NGOs should work in close cooperation with local and central government units and all stakeholders. They can also provide an important link to bi- or multilateral donors, which could support the development of inland fisheries through funding or otherwise.

5.3 The role of fisher associations, cooperatives and self-help groups (SHGs)

Fisher associations and fishery cooperatives can act as independent financial intermediaries by providing loans and microfinance to members and non-members, including SHGs. They might use their own funds for lending as well as those borrowed from financial institutions. Fisher associations and fishery cooperatives can be crucial in efforts to alleviate poverty, empower and motivate rural communities to actively participate in efforts to conserve, rehabilitate, manage and use inland fishery resources in a sustainable manner, and to provide much needed financial support to this endeavour.

SHGs in inland fishing communities, whether functioning as part of fisher associations, fishery cooperatives or independently, can play a catalytic role as financial intermediaries, loan guarantors and as promoters of sustainable inland fisheries development and conservation. SHGs should be small, socially and economically homogeneous groups of 15 to 20 members who voluntarily come together for mutual benefit and support. The groups should be self-managed and practise collective leadership in credit and savings management. Members of SHGs usually lend among themselves, using their own savings before external funds are utilized. Because of the homogeneity of members, loan default risks such as potential loan diversions and defaults are minimized since members know each other well.

SHGs, fisher associations and fishery cooperatives can assist credit and microfinance programmes operated by financial institutions, NGOs, government and donor agencies in the supervision of loan use and loan repayment so that any problems occurring can be identified as early as possible and remedied.

5.4 The role of financial institutions

Financial institutions should put more emphasis on financing inland fisheries. Joint efforts should be undertaken by financial institutions, fisher associations and fishery cooperatives, NGOs and concerned government agencies to promote the setting up of SHGs in inland fishing communities that are capable of managing microfinance and mutual support programmes for the benefit of their members.

Financial institutions should undertake a review of the economic performance of existing inland fishery cooperatives and fisher associations. This review should identify weak and strong points, and make recommendations on how to strengthen the economic performance and credit-worthiness of cooperatives and individual fishers. Ultimately, a credit rating of inland fishery cooperatives and fisher associations should be introduced and regularly updated, which should eventually improve the access of these organizations to institutional and other sources of credit.

Financial institutions should train some of their staff on inland fisheries and on financing inland fishery small and medium-scale enterprises. Training should also be provided on microfinance and poverty alleviation in fishing communities. Training materials for this purpose are available with APRACA.

Financial institutions might wish to employ fisheries experts to check over the appraisal of fisheries loan applications, supervise inland and other fishery loans, and carry out follow-up activities. Such activities may include rescheduling loan repayment, providing additional lending and other financial services. Loan supervision and follow-up to loan disbursements are important steps in the lending process since they support the timely and full repayment of loans, help strengthen the relationship between financial institutions and their clients, and enhance financial institution's knowledge on a new economic sector, client and target group such as inland fisheries.

5.5 The role of donors

Donors can play an important role in all training and capacity-building matters related to inland fisheries development, conservation and financing in the context of rural

credit and microfinance programmes. Technical assistance can be provided through the fielding of experts and trainers, partial or full funding of training and capacity-building programmes, and preparation, production and field-testing of training materials.

Donors can also play a role in disseminating information on lessons learned, success stories, and training and other materials at the subregional, regional or global level. They can organize seminars and workshops as well as carry out comparative studies and technical exchange visits for mutual support and assistance between countries in the same region with similar constraints to and opportunities for the development, conservation and financing of inland fisheries – important tools in the process of information dissemination and mutual support.

In providing support to inland fisheries and its financing, and to poverty alleviation in inland fishing communities, donors should work with APRACA, which has been promoting access of the small-scale fisheries sector to rural credit and microfinance services for many years. In cases where funds for providing microfinance for inland fisheries and inland fishing communities are not available locally, donors can assist in providing these funds on a start-up basis. Providing funds to microfinance institutions should be done in cooperation with APRACA, which is in the process of establishing its own fund for this purpose.

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PART 2

Proceedings and recommendations of regional workshops on credit and microfinance needs for sustainable use of inland fishery resources and poverty alleviation

1. Regional Workshop on Microfinance and Credit Programmes in Support of Responsible Inland Capture Fisheries Practices for Sustainable Use of Inland Fishery Resources

26-30 APRIL 2004, KUALA LUMPUR, MALAYSIA

1.1 PURPOSE

The *Regional Workshop on Microfinance and Credit Programmes in Support of Responsible Inland Capture Fisheries Practices* (the Kuala Lumpur Workshop) was the first of two workshops organized by FAO in 2004 and 2006 in partnership with the APRACA, the Intergovernmental Organization for Marketing Information and Technical Advisory Services for Fishery Products in the Asia Pacific Region (INFOFISH), the Fisheries Development Authority of Malaysia (LKIM), the Department of Fisheries of Malaysia, the Agricultural Development Bank of Malaysia, the China Society of Fisheries, the East China Sea Fisheries Research Institute and the Chinese Academy of Fishery Sciences. The purpose of this first workshop was to bring together representatives of national fisheries administrations and financial institutions as well as representatives of regional organizations concerned with the development, management and financing of fisheries in Asia, with the aim of exploring the scope for increasing technical and financial support to responsible inland capture fisheries development and conservation in Asia. The workshop was the first of its kind with an exclusive regional focus on inland capture fisheries development and finance. It contributed to three bi-annual outputs of the FAO Fisheries Department: RA232A1 – Promotion of responsible inland fisheries and aquaculture; RA232A2 – Increased contribution of aquaculture and inland fisheries to food security; and RA233A2 – Sustainable development of small-scale fisheries.

1.2 WORKSHOP PARTICIPATION AND PROGRAMME

The Kuala Lumpur workshop was jointly organized by FAO, INFOFISH and APRACA, and co-hosted by the Department of Fisheries and LKIM and the Agricultural Development Bank of Malaysia. Thirty-one participants attended from fisheries administrations and financial institutions from China, India, Malaysia, Thailand, Cambodia, Myanmar, Indonesia, Viet Nam and from the Southeast Asian Fisheries Development Center (SEAFDEC). The countries represented at the workshop accounted for almost half of the world's capture fisheries production from inland waters in 2001. (The list of workshop participants is shown in Annex 1.)

The programme of the workshop (shown in Annex 2) consisted of four parts. The first part consisted of key technical presentations that provided background information and country presentations by representatives of fisheries administrations and research institutions. The key technical presentations included a presentation by the Secretary-General of APRACA on his organization's experience with microfinance

programmes in agriculture and fisheries, and a presentation by the General Manager in charge of fisheries and aquaculture finance at the National Bank for Agriculture and Rural Development (NABARD) of India on experiences with fisheries credit management in Asia and Africa and on lessons to be learned for inland fisheries.

Key technical presentations by FAO officers participating in the workshop elaborated on FAO's strategies for the promotion of responsible fishing practices, the role of microfinance and credit for inland fisheries development, and the rehabilitation and conservation of the aquatic environment, as well as on institutional and policy constraints to domestic fish marketing. A representative of INFOFISH provided an overview of the latest trends in fish processing and trade in Asia with special emphasis on inland water fish products.

The country presentations of fisheries administrators and researchers from Malaysia, Indonesia, Myanmar, Cambodia, India, Thailand and Viet Nam focused on the constraints to and opportunities for credit and microfinance support to responsible inland capture fisheries.

The second part of the workshop consisted of country presentations of representatives of financial institutions from Malaysia, Indonesia, Myanmar, Cambodia, India, Thailand and Viet Nam, who gave their views on the constraints to and opportunities for credit and microfinance support to responsible inland capture fisheries.

A field trip to the Tasik Bera Lake in Pahang State constituted the third part of the programme. The participants heard a presentation on the management of the lake and on conservation measures, and had discussions with members of an NGO and a local government unit that manage the lake.

The fourth and final part of the programme consisted of working group and plenary sessions, where the conclusions, recommendations and follow-up proposals were formulated, discussed and adopted.

1.3 WORKSHOP PROCEEDINGS

The opening ceremony of the workshop was addressed by Dr S. Subasinghe, Director of INFOFISH, Dr U. Tietze, FAO, Mr Benedicto Bayaua, Secretary-General of APRACA and Mr Mohd. Nor Hassan, Deputy Director-General of the Fisheries Development Authority of Malaysia.

The presentation on FAO's strategies for the promotion of responsible fishing practices and the role of microfinance and credit provided an overview of the Organization's mandate and strategic framework on its major programme on fisheries and on the related medium-term strategic objectives. It was highlighted that the reduction of food insecurity and rural poverty, the promotion of sustainable rural livelihoods and a more equitable access to resources are major strategies within the FAO's strategic framework for 2000 to 2015. Attention was drawn to the fact that the UN General Assembly Resolution 52/194 of 18 December 1997 acknowledged the important contribution that microfinance programmes have made to poverty eradication and empowerment of the poor. The presentation continued by identifying the most important credit needs in small-scale fisheries and elaborating on appropriate credit policies and procedures for meeting these needs. In conclusion, it was pointed out that in the case of fishers, the alleviation of poverty is an important precondition for their participation in efforts to rehabilitate and conserve the aquatic environment and fishery resources, and for their participation in the implementation of the Code of Conduct for Responsible Fisheries.

The Secretary-General of APRACA provided an overview of how his organization works and how rural financial markets in Asia function, including informal financial intermediaries such as middlemen and traders. He stressed the need for financial institutions to provide innovative rural financial products and services that meet their clients' needs. This can be achieved by linking banks with groups of rural clients, and

focusing on savings and on particular groups of clients and sectors such as inland fisheries. In this connection, he invited the workshop participants to look into the design of workable financial systems for fishing communities that involve all key financial and development actors in a most efficient and effective manner. As far as fishing communities are concerned, the need for financial empowerment leading to the ownership of community-based microfinance institutions was stressed, as was the building of community assets.

The presentation on FAO's strategies for inland fisheries development and the rehabilitation and conservation of the aquatic environment concentrated on inland fisheries development and highlighted the importance of inland capture fisheries in the Asian region, where about 50 percent of the global catch from inland capture fisheries is produced by the eight countries attending the workshop. Attention was drawn to the various environmental threats that can have a negative impact on fisheries and to the need to mitigate them. Reference was made to the FAO Code of Conduct for Responsible Fisheries (CCRF) and the related Technical Guidelines, in particular, FAO Technical Guidelines for Responsible Fisheries No. 6 on Inland Fisheries, emphasizing that the consideration of environmental aspects of fisheries is well-anchored in the CCRF and the Technical Guidelines. It was stressed that in addition to providing microfinancing and credit for traditional investments in the inland capture fisheries sector, for example, for the modernization or replacement of fishing craft and gear, equipment for on-board preservation and handling of fish, financing institutions and funding agencies should consider providing funds for project components designated for habitat conservation or improvement and follow or adopt policies that incorporate comprehensive and sound environmental impact assessments.

These key technical presentations were followed by country presentations of fisheries administrators and researchers from Malaysia, Indonesia, Myanmar, Cambodia, India, Thailand and Viet Nam on the constraints to and opportunities for credit and microfinance support to responsible inland capture fisheries.

The presentation of the NABARD representative on the lessons to be learned for inland fisheries finance familiarized the workshop participants with the experiences of microfinance and credit programmes of various small-scale fisheries development projects in African and Asian countries. The factors that contributed to the success of these programmes were identified, the most important of which were: appropriate planning; well-defined procedures and systems; participatory management; use of simple forms; a simple and flexible approach towards achieving objectives combined with a high degree of monitoring, control and evaluation during project implementation; involvement of professionals in all stages of the project cycle; and a high degree of staff commitment.

The presentation by INFOFISH highlighted the increasing importance of products from freshwater inland fisheries in the regional trade of fish and fish products. An overview was provided of the commercially most important products made from catfish, freshwater prawn, carp, tilapia and eel.

The presentation on institutional and policy constraints to domestic fish marketing discussed various macro-economic policies and how they affect inland fisheries: poverty reduction policies, exchange rate policies, fiscal and investment policies, monetary policies, good governance-promoting policies, legal policies and fishery sector-related marketing policies. Examples were provided of supply-side interventions and transformation interventions. Institutional constraints to the marketing of fish were highlighted, such as the lack of: services at the national level to provide up-to-date market information; institutions that allow fishery sector stakeholders to access credit services in support of their fish marketing activities; services for training fisherfolk and those involved in fish marketing, preparing business plans, and in carrying out financial and economic feasibility studies; government investment in research and development

that focuses on new processing and marketing techniques; and insurance cover for fish marketing activities. Further constraints include complicated regulations and difficult administrative procedures to obtain permits.

At the end of his presentation, the speaker suggested that more information was needed on the importance of inland fisheries for the livelihoods of the poor. Investments in fish marketing infrastructure and market information services are required to reduce losses in quality, add value and generate more benefits for the sector. Awareness should be raised among public and private sector stakeholders of international developments and processes on fisheries management and trade, and on institutional constraints in research and development. It was emphasized that provision of market information, capacity building, and access to credit and insurance will require more public and private sector investments. It was further suggested that governments should put more effort into simplifying administrative procedures and regulatory requirements for those involved in inland fisheries and marketing.

1.4 CONCLUSIONS, RECOMMENDATIONS AND FOLLOW-UP

The discussions following the country presentations and the deliberations of the working groups convened at the end of the workshop concluded that there is ample scope for increasing technical and financial support to responsible inland capture fisheries development and rehabilitation in Asia. This sector has been neglected in the past when attention was focused on offshore marine capture fisheries and aquaculture development, but is now receiving more attention by national governments and regional organizations.

Three working groups were formed on a geographical basis to formulate the conclusions and recommendations of the workshop and to identify the constraints to and opportunities for developing inland capture fisheries, rehabilitating and conserving the inland freshwater aquatic environment, and for supporting these efforts through microfinance and credit programmes. Working Group 1 consisted of participants from China and India; Working Group 2, participants from Cambodia, Myanmar and Malaysia; and Working Group 3, participants from Viet Nam, Thailand and Indonesia.

The workshop participants observed that inland fishery resources in the region are noted for their variety, biodiversity, rich ecological heritage and production potential. It was further noted that rivers and floodplains are the prime source of fish germplasm and thus crucial for the conservation of fish biodiversity. Millions of fishers and their families depend on rivers and floodplains for their livelihoods. It was also observed that the present level of fish production from inland waters was below the potential, in many cases due to low priority given to the sector by government and investors.

The main threats to sustainable inland fisheries were identified as: the reduction of survival space and modification of habitat of fish and aquatic organisms; deforestation, pollution of water bodies and the aquatic environment; overfishing and destructive fishing practices; and local conflict in the management and utilization of migratory fish stocks and water bodies. Additional main threats were the lack of capital needed for the development and rehabilitation of inland fisheries and, related to this, the lack of the awareness of financial institutions of the investment and credit needs of inland fisheries.

Other constraints to a proper and sustainable utilization of inland waters include: short-term leasing policies of open water bodies, inadequate conservation measures; inadequate and/or malfunctioning of infrastructure for fish hatching and nursing; inadequate infrastructure for post-harvest handling and marketing; inadequate data on current and potential levels of exploitation of water bodies; inadequate financial assistance, investment support and credit supply to inland fisheries; and exploitation of fishers and primary producers by traders.

The working groups also identified measures that could be taken to overcome the constraints and move towards a sustainable use and rehabilitation of inland fishery resources. These include, *inter alia*: improving habitats in rivers, floodplains and other inland waters; facilitating fish migration through retrofitting dams with fish passes and by constructing appropriate fish passage facilities when new dams are built; conserving wetlands; training and socially mobilizing fishers and their associations; upgrading skills of extension workers; and improving infrastructure with regard to hatchery and nursery units, landing centres, transportation, marketing, cold storages and ice plants. Other measures were: implementing effective microfinance programmes; creating civil society organizations such as SHGs and their federations to reduce the negative influence of traders and middlemen; increasing active participation of inland fishers in the use and management of inland fishery resources; introducing insurance facilities for fisheries assets and life insurance facilities for fishers; improving access to investment credit and working capital credit facilities; and introducing long-term leasing policies for publicly owned open water bodies to encourage investment and sustainable development inputs and efforts.

With a view to counter the threats to inland waters and fisheries and take advantage of opportunities for sustainable inland fisheries development and rehabilitation, close cooperation between stakeholders, local management authorities and government bodies and financial institutions responsible for financing agriculture and fisheries was deemed crucial. In order to advance this cooperation and to initiate pilot activities at the national level, a number of case studies were proposed by the working groups and in plenary to be carried out as follow-up to the workshop. The case studies should be conducted jointly by fisheries administrations and financial institutions in close cooperation with local stakeholders and management authorities, and should focus on a particular water body, i.e. a lake, river or reservoir, with potential and need for rehabilitation and development. The case studies should identify the action that needs to be taken for a comprehensive rehabilitation and development of the water body, as well as the role and responsibility of each actor.

In the concluding plenary session of the workshop, it was proposed to review the findings of the case studies at a second workshop and to formulate guidelines based on the recommendations of the case studies. The second regional workshop was held in Beijing, China from 14 to 17 February 2006. The proceedings and recommendations of the second regional workshop are described in Part 2 of this report and the case studies are presented in Part 3.

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ANNEX 2. PROGRAMME OF ACTIVITIES

Day and time	Session/Chair/Presenter
Day 1 – Monday, 26 April 2004	
9.00-9.45	Opening ceremony • Welcome address by Dr S. Subasinghe, Director, INFOFISH • Address by Dr U. Tietze, FAO • Address by Mr B. Bayaua, Secretary-General, APRACA • Opening address by Mr. Mohd. Nor Hassan, Deputy Director-General, Fisheries Development Authority of Malaysia
9.45-10.00	Refreshments
	Chair: Dr S. Subasinghe, Director, INFOFISH
10.00-10.40	*FAO's strategies for the promotion of responsible fishing practices and the role of microfinance and credit*, by Dr U. Tietze, FAO Fishery Industry Officer
10.40-11.20	*APRACA's experience with microfinance programmes in agriculture and fisheries*, by Mr. B. Bayaua, Secretary-General, APRACA
11.20-12.00	*Inland fisheries development and the rehabilitation and conservation of the aquatic environment,* by Mr. G. Marmulla, FAO Fishery Resources Officer
12.00-12.30	Group photograph
12.30-13.30	Lunch break
13.30-15.30	Opportunities for the promotion of responsible inland capture fisheries practices. Country presentations by representatives of national fisheries administrations: • Malaysia • Indonesia • Myanmar • Cambodia
15.30-15.45	Tea break
	Chair: Dr D.P.S. Chauhan, Deputy Commissioner, GOI
15.45-17.45	Continued: • China • Thailand • Viet Nam
19.00-21.00	Dinner reception by the Director of INFOFISH
Day 2 - Tuesday, 27 April 2004	
9.00-9.45	Continued: • India
	Chair: Dr Son Koun Thor, Chairman and President, Rural Development Bank of Cambodia
9.45-10.30	*Experiences of fisheries credit management of field projects in Africa and Asia – lessons to be learned for inland fisheries finance*, by Mr M.A. Upare, General Manager, NABARD
10.30-10.45	Tea break
10.45-11.15	*Latest trends of fish processing and trade in Asia*, by Mr Tarlochan Singh, INFOFISH
11.15-12.00	*A case study on institutional and policy constraints to domestic fish marketing in Asia,* by Mr R. van Anrooy, FAO Fishery Planning Analyst

12.00-13.00	Lunch break
	Chair: Mr B. Bayaua, Secretary-General, APRACA
13.00-15.30	Constraints to and opportunities for credit and microfinance support to responsible inland capture fisheries – country presentations by representatives of financial institutions • Malaysia • Indonesia • Myanmar • Cambodia • India
15.30-15.45	Tea break
15.45-18.00	Continued: • Thailand • Viet Nam
Wednesday, 28.4.2004	
7.00-18.00	Field visit to Tasik Bera Lake. Discussions with stakeholders, NGO and local government representatives
Thursday, 29.4.2004	
	Chair: Ms Hajah Mahyam Mohd Isa, SEAFDEC
9.00-10.00	Plenary session on formulation of workshop recommendations and identification of topics for country-specific case studies
9.00-10.30	Formation of working groups and selection of chairpersons and rapporteurs
10.30-10.45	Tea break
10.45-12.30	Working group sessions
12.30-14.00	Lunch break
14.00-16.00	Continuation of working groups
16.00-16.15	Tea break
16.15-18.00	Formulations of working group recommendations and reports
Day 3 – Friday, 30 April 2004	
	Chair: Mrs S. Sundari, General Manager, Bank Rakyat Indonesia
9.00-10.30	Plenary session – presentation and discussion of working group reports and recommendations
10.30-10.45	Tea break
10.45-11.45	Continuation of plenary session
11.45-12.15	Closing ceremony

2. Regional Workshop on Guidance for Credit and Microfinance Programmes in Support of Sustainable Use of Inland Fishery Resources and Poverty Alleviation

14-17 FEBRUARY 2006, BEIJING, CHINA

2.1 PURPOSE

The Regional Workshop on Guidance for Credit and Microfinance Programmes in Support of Sustainable Use of Inland Fishery Resources and Poverty Alleviation was a follow-up to the Kuala Lumpur Workshop. One of the recommendations of this earlier workshop was for fisheries administrations and financial institutions to conduct case studies in close cooperation with stakeholders and management authorities, with a focus on the action that needs to be taken for a comprehensive rehabilitation and development of particular water bodies. In addition, the previous workshop proposed the documentation of success stories and positive examples of how inland fisheries had been rehabilitated and developed in a sustainable way, in close cooperation with financial institutions, stakeholders and fisheries administrations, and the development of guidelines for improving the provision of microfinance and credit services to the inland capture fisheries.

The workshop was held at the Beijing Guangxi Plaza, Beijing and attended by 44 participants from Cambodia, India, Indonesia, Malaysia, Myanmar, Thailand, Viet Nam and China. (The list of participants is shown in Annex 1.) The objectives of the workshop were to: review the case studies and success stories; discuss the constraints to and opportunities for the development and sustainable use of inland fisheries; and formulate recommendations and guidelines for credit and microfinance programmes in support of the sustainable use of inland fishery resources and poverty alleviation.

2.2 PARTICIPATION AND WORKSHOP PROCEEDINGS

The opening ceremony was attended by the Vice-Director of the Bureau of Fisheries of the Ministry of Agriculture of China, the FAO Representative in China, the Director of the East China Sea Fisheries Research Institute, the Secretary-General and the Director of the China Society of Fisheries. Case studies were presented by participants from China, Myanmar, India and Cambodia. Several inland fisheries development success stories from China and Malaysia were also presented. Representatives of member institutions of APRACA gave presentations on their financial institutions' programmes in the fisheries sector. Two working group sessions were organized: a working group on the constraints to and opportunities for the sustainable use of inland fishery resources, and a working group to discuss draft guidelines for meeting credit and microfinance needs in inland fisheries development and conservation in Asia, which had been prepared by the organizers of the workshop. The draft guidelines were based on the case studies and success stories that had been written up following the

recommendations of the Kuala Lumpur Workshop. (The programme of the Beijing Workshop is attached as Annex 2.)

Opening of workshop

Dr Ping Zhuang of the East China Sea Fisheries Research Institute called the workshop to order and welcomed the workshop participants, both foreign and national. He then introduced the speakers at the opening ceremony. Mr Liu Zheng, Vice-Director of the Fisheries Bureau of the Ministry of Agriculture of China, warmly welcomed the workshop participants on behalf of the Fisheries Bureau of China. The speaker referred to the beginning of the Chinese New Year and the recently concluded Tet festival, and wished all participants good health. Mr Liu Zheng stressed that while increasing inland fisheries production was an important goal in China, any increase should be achieved in an environmentally sustainable manner. He noted that in recent years, great progress has been made in Chinese inland fisheries. He said that the sector plays an important role in ensuring food supplies and food security, and in increasing the income of farmers and fishers. He added that rapid industrialization, continued growth of the population, and overexploitation of water resources are limiting the development of Chinese inland fisheries. The main threats to sustainable inland fisheries are: the reduction of survival space and modification of habitats for fish and aquatic organisms; pollution of water bodies and the aquatic environment; the degeneration of fish germplasm; and local conflicts in the management and utilization of migratory fish stocks. Other main threats are the lack of capital needed for the development and rehabilitation of inland fisheries and, related to this, the lack of awareness among financial institutions of the investment and credit needs of inland fisheries.

Mr Liu Zheng informed the participants of the workshop that the Chinese Government had adopted a series of measures to ensure a sustainable development of fisheries. As early as February 1979, the State Council of China had issued regulations for the protection of the breeding of aquatic resources. Later, the Chinese Government enacted the Law of the People's Republic of China on the Prevention of Water Pollution (1984), the Law of the People's Republic of China on Fishery (1986) and its revision (2000), the Law of the People's Republic of China on Environmental Protection (1989), and Regulations of the People's Republic of China on the Protection of Wild Animals (1993). All these laws and regulations form the framework within which inland fisheries can be developed sustainably. He then referred to the Yangtze River, known as the "Mother River of China", and the efforts of the Chinese Government to protect its fishery resources. He added that the Chinese Government is concerned about the use of inland fish stocks and will make more efforts to promote environmentally friendly production for poverty alleviation. Mr Liu Zheng asked the workshop participants to join efforts to improve cooperation towards sustainable development of fisheries in the Asia-Pacific region and to jointly strive towards the global aim of responsible fisheries development. At the end of his speech, he wished all participants a pleasant stay in Beijing and a successful workshop.

Dr Noureddin Mona, FAO Representative for China, DPR Korea and Mongolia, warmly welcomed the participants on behalf of FAO. He thanked the China Society of Fisheries for hosting and supporting the workshop. Dr Mona mentioned FAO's long-term strategy and referred to the major programme on fisheries. He said that fisheries should be at the top of the global agenda. He stressed that the sustainable development of inland fisheries is very important for improving the livelihoods of fishers living in inland areas in Asia. He argued that inland fisheries need support from governments, financial institutions, international organizations and non-government organizations (NGOs) in sustainable development. He hoped that the workshop would come up with specific recommendations and assured that FAO would fully support the development of inland fisheries in China and elsewhere.

Dr Susana Siar, on behalf of the FAO Fisheries Department, welcomed the participants and thanked the collaborating institutions. She mentioned that the mission of the FAO Fisheries Department is to facilitate and secure the long-term sustainable development and utilization of the world's fishery resources, which entails: (i) meeting global and national food security; (ii) alleviating poverty and sustaining livelihoods; and (iii) contributing to national and international trade. She also stated that one of the major activities of the FAO Fisheries Department is the formulation of guidelines and extension materials for micro-enterprise and microfinance development in support of poverty alleviation in small-scale fishing communities, and the pilot-testing of these materials in close cooperation with fishing communities, fisheries development agencies and NGOs. She added that the regional workshop provides an opportunity to formulate recommendations and guidelines for credit and microfinance in support of a sustainable use of inland fishery resources and poverty alleviation that would be useful to many countries in Asia.

The last speaker in the opening ceremony was Prof. Chen Xuezhong, Director of the East China Fisheries Research Institute of the Chinese Academy of Sciences. He extended his welcome to all of the guests and his appreciation for their attendance. In view of the current status of inland aquatic resources and environment, the Chinese Government has adopted a series of strategies based on its fisheries development policy to ensure the sustainable development of the fishery industry and to protect and rehabilitate fishery resources, fisheries ecology and the aquatic environment. He mentioned that China is one of the countries with the largest freshwater areas in the world, having 6.84 million ha of rivers, 24 000 lakes and 83 000 reservoirs, which provide vast spaces for the development of inland fisheries. He noted also that Chinese inland fisheries have developed greatly since adopting policy reform and opening up to the outside world. By 2004, Chinese freshwater aquatic production was estimated at 21.34 million tonnes, which amounted to 43.5 percent of China's total fish production. Preliminary statistics for 2005 suggest that the freshwater aquatic production had increased further to 22.41 million tonnes, which is equivalent to 43.9 percent of the nation's total aquatic production. From these figures he concluded that inland fisheries have become a major component of the fishery economy and is an important source of high-quality protein resources for people living in China's inland areas. The speaker then highlighted some research achievements and illustrated how they were used in policy formulation, planning and implementation by the government. Prof. Chen Xuezhong concluded his address by expressing his hope that the workshop would contribute to a sustainable and harmonious development of the inland fisheries sector in Asia, and wished all participants a pleasant stay in Beijing.

Presentations – Day 1

The workshop proceedings commenced with a presentation on the background and objectives of the workshop by Mr Gerd Marmulla, Fishery Resources Officer of FAO Rome. The speaker referred to the existing documentation on credit and microfinance in marine fisheries and aquaculture, and the lack of information on credit and microfinance in inland fisheries. He then summarized the outcome and recommendations of the Kuala Lumpur Workshop, and its follow-up. At the end of his presentation, Mr Marmulla introduced the agenda of the Beijing Workshop, which was adopted without changes by the participants. He announced that Mr Benedicto Bayaua of APRACA had been so kind as to accept the invitation to act as Chair on the first day of the workshop.

Mr Benedicto Bayaua opened the plenary session on the presentation of country case studies and invited Dr Xie Yingliang of the East China Sea Fisheries Research Institute to present his joint paper with Dr Zhu Decheng entitled *The potential for inland fisheries development and rehabilitation, and supporting credit and microfinance*

programmes at Lake Luoma, China. (The full paper is included in Part 3.) The speaker referred to the ecology of Lake Luoma and its location, environment, precipitation, freshwater fish and shrimp species, aquatic plants, production potential and capture fisheries trends. He then highlighted the constraints to further development of inland capture fisheries in Lake Luoma such as: the low educational level of fishers, which hampers the implementation of management measures, droughts; pollution; illegal, unregulated and unreported (IUU) fishing practices; and the increase in numbers of mostly non-motorized fishing vessels and in fishing activities, which results in overfishing.

Dr Xie Yingliang continued his presentation by highlighting the rapid growth of aquaculture in the lake, which commenced in 1986, and then turned his attention to finance and credit aspects related to inland fisheries regulations and management. He analysed the problems encountered by the Agricultural Development Bank of China and by rural credit cooperatives in the provision of credit to the inland fisheries sector, and government policies on microcredit in support of rural development. The speaker explained the system of loan cards used in microcredit schemes in rural areas, the conditions to be met before a loan is approved, loan assessment methodologies, credit rating and interest rates.

He also discussed the *Action Plan for the Sustainable Development of Inland Fisheries* (2004-2010), which includes measures such as:

- the protection of aquatic plants and benthic organisms;
- the ban of boats with snail suction machines;
- limitation of the number of sand excavation vessels;
- closure of the fishing season from 1 March to 1 June;
- establishment of year-round closed areas for fishing;
- improved enforcement of management regulations;
- introduction of fishing licences and fishing quotas;
- intensification of stock enhancement;
- moderation of aquaculture development;
- guidance of fishers on exploitation and management matters;
- training programmes for fishers;
- provision of finance and credit for sustainable fisheries and aquaculture.

Dr Xie Yingliang then elaborated on the financing of fisheries activities and fisheries research. The speaker concluded his presentation by highlighting that fees are currently collected from the lake resource users, which are used for the enhancement of the lake's fishery resources.

In the discussion that followed the presentation, questions were raised on how fishers earn their livelihoods when the fishing season is closed or some areas are closed for the whole year. The presenter responded that the protection of breeding areas was necessary and that fishers moved their operations to other parts of the lake that were open to fishing. Other questions concerned the logistics of collecting fees from resource users and using them for fishery resources enhancement. Dr Xie Yingliang explained that fishery resources enhancement fees were calculated and collected annually based on the tonnage of the fishing vessel, and in the case of fish farmers, in relation to the income obtained from fish farming. In response to other questions, the speaker explained the adopted borrowers' credit rating system and how it estimates their capacity to repay loans.

The afternoon session of the first day of the workshop commenced with a presentation by Ms Nu Nu Aye from the Myanmar Agricultural Development Bank, and Mr Khin Maung Win of the Department of Fisheries of Myanmar, on institutional credit and microfinance in Myanmar, with special reference to the livelihoods at Lake Inlay, Southern Shan State. (Their joint paper is shown in Part 3.) Ms Nu Nu Aye started her presentation with an overview of the livelihoods of the fishers of Lake

Inlay, the morphology and the state of the water resources of the lake, and biological information. She mentioned that the lake is also important as a tourist site and for aquatic weeds production. A discussion of the fisheries management at the lake followed, emphasizing that management started as early as 1918.

The presentation continued with an overview of microcredit in Myanmar. Past and present lending activities of various formal credit suppliers to fishers of the lake were described, including those of the Myanmar Agricultural Development Bank (MADB) and the Myanmar Livestock and Fisheries Development Bank (MLFDB). The speaker then discussed the microfinance project, *Sustainable Micro-finance to Improve the Livelihoods of the Poor*, implemented in 2003. To date, the project has provided over 138 000 poor households with microfinance services and the loan repayment rate is about 95 percent. Main outcomes of the project were increased incomes of the poor, the empowerment of women, and the creation of sustainable microfinance schemes in the country. Ms Nu Nu Aye then referred to various NGO-supported credit and microfinance programmes in the country. She concluded her presentation with a reference to current opportunities for inland fisheries development, which include fine-tuning laws and regulations, increasing cooperation between stakeholders in microfinance, and increasing the number of bank branches in rural areas.

The discussion that followed the presentation focused on the coverage of the credit programmes in Myanmar, on the problems of securing the required funds for microfinance schemes, and on exports of aquatic products from Myanmar to China.

The second presentation of the afternoon session by Dr P.V. Dehadrai from the Centre for Sustainable Aquaculture and Fisheries in India discussed management challenges regarding riverine fisheries and fishers in India. (His paper can be found in Part 3.) In his presentation, the speaker focused on the potential for inland fisheries development and the rehabilitation of fisheries along the Ganga River system. Dr Dehadrai identified the main problems of the Ganga's fisheries as: pollution from domestic waste and industries; conflicts regarding ownership and use of the water resources; high fishing effort and exploitation levels; and the limited coordination between the various state governments of the territories where the Ganga River flows. The speaker highlighted the poverty situation of inland fishers, particularly their lack of income during the monsoon season.

He then turned his attention to ongoing initiatives to rehabilitate the ecology of the Ganga River system, and to improve the management of its fishery resources and the livelihoods of the rural poor living along the river. He advocated a cluster approach to development in which initiatives would focus first on small clusters of villages and later be replicated elsewhere.

Dr Dehadrai went on to discuss sources of microfinance and credit. He pointed out that the National Bank for Agriculture and Rural Development (NABARD) refinances the largest microfinance programme in the world. He also mentioned that the Fisheries Cooperatives Federation (FishCopFed) has insured more than 1.3 million fisherfolk in India and that insurance cover gives them better access to institutional credit and microfinance. The speaker identified a variety of alternative livelihood opportunities for fishers with the potential to generate additional and alternative income. He stressed that fisheries management and development cannot be separated from credit and microfinance, and that fishers needed microfinance support to adjust themselves to fisheries management regulations that affect their livelihoods. He drew on the experiences of successful microfinance programmes in India that had adopted this approach using groups of villages to create centres of hope for future replication of good management practices along the entire Ganga River system.

The speaker ended his presentation by highlighting the important role that women play in inland fisheries and their good track record as borrowers and participants in microfinance programmes.

The discussion following his presentation centred on the cluster approach proposed by the speaker to rehabilitating ecology and fisheries along the Ganga River system. Questions were raised on how a river basin commission functions and on how to improve it in light of present problems and conflicts concerning jurisdictions and communication.

Credit and Microfinance Programmes in Inland Capture Fisheries in West Bengal and Assam was presented by Mr Upare of NABARD (see Part 3). He began by giving an overview of the microfinance system in India. He discussed partnerships with commercial banks, NGOs, cooperatives and rural banks. The speaker explained the functioning of SHGs in support of inland fisheries and the role of national cooperative development corporations. Mr Upare gave examples from Orissa State of the success of a self-help group (SHG) in credit and microfinance programmes that integrate fisheries with other activities. He emphasized the importance of reducing risk by diversifying economic activities. The speaker then identified key elements of successful microfinance mechanisms, which included:

- group formation (homogenous groups, voluntary savings, group composition by gender, mutual agreement on the use of the funds);
- clear and comprehensive procedures for extending bank finance to SHGs, NGOs and other financial intermediaries;
- availability of proper support services, including fisheries extension services;
- establishment, use and maintenance of management information systems (MIS).

Mr Upare ended his presentation with some recommendations, which included expansion of the microfinance movement, formation and involvement of SHGs and fisher associations and groups, development of micro-enterprises, support from international organizations for pilot projects in inland fisheries microfinance, and strengthening of databases.

The issue of savings mobilization was given greatest attention in the discussion that followed the presentation. It was emphasized that compulsory savings were needed for SHGs before providing access to groups to credit as a learning element. The waiving of stamp duties of one percent of the total loan amount for poor borrowers was brought up in the discussion, and it was mentioned that some Indian states already waive the stamp duty in the case of poor borrowers. The issue was raised on availability of loans for alternative livelihoods development, including for the introduction of new technologies. It was argued that banks are more hesitant to provide credit since risks involved in the use of new technologies are not always known. Also discussed were the pros and cons of providing loans to individual members of SHGs through group lending compared to providing individual loans with joint liability.

The last presentation of the first day of the workshop was delivered by Mr Heng Sotharith of the Department of Fisheries of Cambodia, entitled *Increasing Inland Fisheries Production and Livelihood Security in Cambodia through Fishery Policy Reform and Aquaculture Development – Prospects and Constraints* (see Part 3). Mr Sotharith provided an overview of the current status and trends in inland fisheries development in his country, referring to the contribution of inland fisheries to the economy, the latest fisheries reforms, national fisheries policy and current fisheries management practices. He mentioned that a new fisheries law is being prepared and will be issued soon.

Mr Sotharith then gave an overview of fisheries in Cambodia, fishing gears and techniques, production in marine and inland water bodies, species caught, the fishing lot system and the reduction in the number of fishing lots, the establishment of community fisheries and their role in the co-management of fishery resources, and the constraints to inland fisheries development. The speaker continued by listing the needs for microfinance in inland aquaculture development. His presentation concluded with emphasis on the important linkages between aquaculture and inland capture fisheries.

Examples included fish not wanted for human consumption to be used for aqua feeds, and job creation in aquaculture, which would reduce pressure on inland capture fishery resources and should be supported through microfinance schemes.

The concept of co-management, as promoted by the Mekong River Commission, was one of the topics discussed following the presentation. It was argued that co-management is only possible when fishers and their communities at large know the value of the environment and the fishery resources in the area under their management. This would allow them to find a better balance between the use of the natural resources by current and future generations.

Presentations and working group sessions – Day 2

Prof Huang Shuo Lin, Vice-President of the Shanghai Fisheries University, chaired the second day of the workshop, which focused on success stories and experiences with microfinance in fisheries. The first presentation was the success story of inland fisheries development and rehabilitation, and supporting credit and microfinance programmes at Lake Taihu by Dr Xie Yingliang (see Part 3). Lake Taihu is one of the five largest freshwater lakes in China, occupying 0.4 percent of the total land area of the country. It belongs to three provinces – Jiangsu, Zhejiang and Anhui. Dr Xie Yingliang divided the main constraints to inland fisheries at Lake Taihu into ecological and environmental constraints, on the one hand, and social and economic constraints, on the other hand. The main ecological and environmental constraints are as follows:

- Dams and sluice gates constructed along the rivers and lakes in the basin of Lake Taihu in the 1950s and 1960s led to a decline in stocks of migratory species and species that depend on shorter intra-river movements for the successful completion of their lifecycle.
- Much of the shallow water areas along the lake had been enclosed and separated from the lake for cultivation in the 1960s and 1970s, which resulted in the decline of stocks of fish and shrimp that spawn and grow there.
- Destructive fishing gear and methods brought about the decline of large and mid-sized fish and a proportional increase of the percentage of young fish as well as a decrease in the average size of fish.
- The environment and ecology of the lake area has deteriorated.

The speaker identified the social and economic constraints as follows:

- Wastewater from industrial and agricultural activities affected the yield and water quality in the lake, which is also important for tourism.
- Trawling, the main fishing gear used in the lake, had a negative influence on the rehabilitation of benthos in the open water areas of the lake.

Dr Xie Yingliang identified the following main measures to overcome constraints to inland fisheries development at Lake Taihu as follows:

- enhancement of fish stocks through the stocking of lake waters;
- establishment of seasonal conservation zone for spawning;
- expansion of closed fishing season;
- eventual ban and restriction of the use of harmful fishing gear and methods;
- enforcement of the system of fishing licences;
- comprehensive development of fishery industry;
- a combination of capture fisheries with fish farming.

The speaker went on to explain the history of fisheries management at Lake Taihu and the role of the various organizations and institutions involved, such as the Fisheries Management Committee (FMC). He also explained the system of resource user fees: fees are collected from fishers and fish farmers in order to fund inland fishery resources enhancement.

The speaker concluded his presentation with an overview of the various sources of credit and microfinance that are available to fishers and fish farmers and that help

them finance capital investments and working capital expenditure required for taking up fish farming, acquiring responsible fishing gear and expanding fish marketing and processing.

The discussion that followed the presentation revolved around the functioning of the FMC. It was explained that FMCs have been established at large lakes in China which, among other things, formulate policies for the collection of resource use fees from fishers and fish farmers. An FMC is usually composed of representatives of the Provincial Fisheries Bureau, fishers, and other local government agencies. He pointed out that the manager of the FMC is always from a government agency. It was also asked if children of fishers follow their parents' occupation. The speaker's response was that many do, but that some pursue higher education and choose professions other than fishing or fish farming.

The next presentation was given by Ms Mahyam Mohd. Isa of Malaysia on the successful involvement of local communities in conservation programmes of Malayan Mahseer in River Kinabatangan of Sabah. (Her joint paper with Mr Jephrin Wong is provided in Part 3.) In the State of Sabah, the Department of Fisheries recognized the urgency to address the problem of the decline in the numbers of freshwater fishes, which has affected the livelihoods of rural communities. The Fisheries Department adopted two strategies to address the problem, namely, introducing freshwater pond culture and encouraging rural communities to restore the riverine fishery resources through a community-based fisheries resource management system locally called the *Tagal* System.

Ms Mahyam's presentation highlighted some of the work carried out by local communities in conserving and restoring the Malayan Mahseer, one of the endangered freshwater species of River Kinabatangan, through the *Tagal* community-based fisheries resource management system. The presentation described how the *Tagal* system works, its present status in Sabah, strategies to make the system sustainable, and the activities of the Sabah Fisheries Department. The Sabah Fisheries Department's plan to promote ecotourism in *Tagal*-managed areas to generate new income for the community with credit and microfinance support for the necessary investments was discussed.

The *Tagal* system is a smart partnership between community and government with the Department of Fisheries of Sabah as the lead agency for protecting, reviving, conserving and managing riverine fishery resources in the state. To participate in the *Tagal* system, each community must traditionally exploit at least one deep pool where it manages and controls its fishery resources under the leadership of its headman. The state fisheries officers and district officers act as consultants of the *Tagal* committee. The community and the Department of Fisheries have specific roles to play in the *Tagal* system. In *Tagal*-managed water bodies, the fishery is divided into three zones: a red zone, which is exclusively meant for conservation and where no fishing is allowed; an orange zone, where fishing is restricted and where the revenue from a part of the catch is used to finance the *Tagal* management system; and a green zone, where fishing is allowed all year round under strict regulations. Only mesh sizes of over 75 mm, hook and lines and castnets are allowed to be used.

According to Ms Mahyam Mohd Isa, the *Tagal* system has succeeded and revived many previously depleted riverine fishery resources in the upstream rivers of Sabah, especially with regard to indigenous fish species such as *Ikan Pelian Kelah* / Mahseer (*Tor spp.*). As of 1 August 2005, 212 villages in Sabah have practised the *Tagal* system along 107 rivers. The system is now well known and many other states in Malaysia are keen to replicate it.

The speaker pointed out that the sustainable development of inland fisheries in Malaysia is hampered by a lack of innovative financial instruments. Most financial institutions are less inclined to finance agricultural and food production due to higher risk and longer repayment periods. Instead, they are more inclined to financing large

commercial projects such as oil palm plantations, forestry and logging and agro-based manufacturing industries, such as rubber processing, palm oil processing, wood products, food, beverages and tobacco. The government can provide limited resources only.

Presently, financial support for inland fisheries in Malaysia comes mainly from commercial banks, finance companies, merchant banks, the Federal Land Development Authority (FELDA), Sabah Development Bank, the Agriculture Bank of Malaysia (Bank Pertanian Malaysia – BPM) and Bank Rakyat, as well as from farmer, fisher and other agro-based organizations. BPM's microcredit programme was launched on 3 June 2003 after the announcement of an economic package by the Prime Minister on 21 May 2003. The scheme started with an initial capital injection of RM200 million from the government and will be increased to RM500 million when the fund for the scheme has been finally raised. The scheme was offered to small-scale entrepreneurs in agriculture-related projects including fisheries for investments in production, processing and marketing. The maximum loan size was RM20 000 (US$5 263) with an interest rate of 4 percent per annum and a loan repayment period of up to four years. By October 2003, RM188.6 million (US$49.6 million) had been disbursed to borrowers with an outstanding loan balance of RM174.1 million (US$45.8 million). The loan repayment rate is presently 92 percent.

This presentation was followed by three others from representatives of APRACA member institutions: the Bank for Agriculture and Agricultural Cooperatives (BAAC) of Thailand, Bank Rakyat Indonesia and Agribank of Viet Nam. The presentations gave an overview of the rural credit and microfinance operations of these banks in the fisheries and inland fisheries sector. Past achievements and constraints were highlighted and strategies for the future were elaborated on.

Mr. Arun Lertwilai of BAAC gave an overview of the history and role of his bank, which is the major source of credit and microfinance for farmers and other rural entrepreneurs in Thailand. The bank has flexible and client-oriented lending programmes and procedures, and lends to individuals and groups as well as to cooperatives and associations. Joint liability of groups is one of the collaterals accepted by BAAC. The speaker pointed out that BAAC is applying a credit rating to borrowers that encourages proper use and repayment of loans, and provides interest rate incentives to those with a high credit rating. It not only provides credit for investment and working capital purposes, but also for consumption, health, housing, education and other needs.

BAAC also caters to inland fisheries. In 2004, lending to inland fisheries alone (i.e. mainly to inland aquaculture) accounted for 5.75 percent of the bank's total lending for agriculture, which amounted to US$215 million. Loans are mainly provided for freshwater shrimp and fish farming. Ninety percent of BAAC's inland fisheries clients are small-scale fish farmers and fishers. Past constraints to lending in the inland fisheries sector were identified as environmental and marketing problems.

As far as future lending for inland fisheries is concerned, the speaker pointed out that BAAC is planning to expand and improve its lending activities. The expansion will take place in the framework of the *Seafood Bank Project*. Within this framework, the bank cooperates with the Department of Fisheries of Thailand to promote responsible and environment-friendly aquaculture practices in order to improve the quality and safety of fish products, cater to new and more remunerative markets including export markets, and reduce the cost and increase the revenue of fish farming operations. The bank is also preparing standard technology and credit packages for different types and sizes of fish and shrimp farms in order to guide investors and to standardize the appraisal of loan applications, including the assessment of the environmental impact of proposed projects.

Mr. Lertwilai of BAAC concluded his presentation with the success story of the Ban Sang Organic Freshwater Shrimp Farmer Group of Prachinbury Province, Thailand.

With credit support from BAAC and technical advice from the Department of Fisheries of Thailand, the group grows shrimp using exclusively organic feed and fertilizers, and organic substances for pond preparation and disease prevention and control. Following this success story, BAAC is now funding 41 other organic freshwater shrimp farms, each of which took a loan of US$18 800 to meet capital investment and working capital requirements. The shrimp farms are all operating profitably and in an environmentally friendly and sustainable manner.

Mr Achmad Chairul Ganie of Bank Rakyat Indonesia (BRI) began his presentation with an overview of the recent history and organizational structure of his bank, the biggest agricultural bank in Indonesia, with an extensive branch network in rural areas. He pointed out that Bank Rakyat Indonesia has recently undergone a radical reorganization and has now become a profitable and efficient financial intermediary with a large microfinance programme that caters to the rural poor.

The speaker explained that prior to the reorganization, the bank had provided loans to small-scale inland fish farmers and fishers through large commercial companies under its *nucleus-plasma* programme. The large companies were considered a nucleus that channeled the bank's fund to the fishers and fish farmers and guaranteed the loan. The fishers and fish farmers, considered "plasma" were in turn obliged to sell their production to the company through which the loan was channeled.

The speaker pointed out that the nucleus-plasma programme had not worked satisfactorily. The bank encountered difficulties in supervising and monitoring its lending operations and many of the companies through which the loans were channeled had financial and management problems and could not effectively guarantee the loans. There were also conflicts between nucleus and plasma, which hampered the proper use of loans and their repayment.

After its reorganization, the bank started to lend directly to individual fishers and fish farmers at the village level, which were organized into microfinance groups. Consequently, the proper use of loans and their repayment improved drastically. Lending is accompanied by compulsory savings schemes. Each group receives training and elects four to nine office bearers including a head, an accountant, a cashier and a teller. The bank provides up to IDR3 million without collateral and up to IDR50 million with collateral. Lending procedures are simple, timely and flexible, and include: registration of a loan application; a site visit and interview of the loan applicant; an appraisal of the loan application; an evaluation of the proposed collateral, if any; preparation of a loan disbursement and repayment schedule that is compatible with the cash flow of the proposed economic activity; and the signing of a loan agreement. The maximum period between the registration of a loan application and the decision on whether the application is approved or rejected is only seven days.

The speaker pointed out that in addition to inland fisheries, BRI also disburses loans to fishers in coastal fishing communities. This is carried out within the Coastal Community Empowerment Programme of the Indonesian Government. Funds are provided from the budget of the Department of Marine Affairs and Fisheries, which cooperates closely with BRI. The programme is designed to empower coastal communities and ensure their participation in the management of coastal and aquatic resources, develop entrepreneurship and provide microfinance support for small-scale enterprise development, income generation and poverty alleviation.

Loans under this programme are also provided through cooperatives to their members. The presenter concluded his presentation by sharing the success stories of the fishing communities of Baharu, Sahuda, Muhtar and Harnah.

Mr Nguyen Viet Tuc of Agribank, the Vietnam Bank for Agriculture and Rural Development, introduced his bank as the leading commercial bank in Viet Nam, which is owned by the Vietnamese Government. The speaker highlighted important economic, demographic and geographic characteristics of his country and pointed

out that most enterprises and businesses are micro and small-scale enterprises. These enterprises play a crucial role in the economic development of the country and an important social role by providing employment and income in rural areas contributing to food security and poverty alleviation. The speaker pointed out that the fisheries industry shows an average annual growth of 5.3 percent.

Mr Nguyen Viet Tuc continued his presentation with an overview of Agribank. Between 1997 and 2005, the bank enjoyed an average annual growth rate of 30 percent. It now has 2002 branches and transaction offices, an 80 percent market share of the formal and semi-formal credit market, and total fund resources of VND12.3 billion. Sixty percent of the loan portfolio goes to households and individuals, 29 percent to small and medium-sized enterprises, and 11 percent to state-owned enterprises. Loan recovery is considered good.

The speaker identified the reasons behind the good performance and growth of his bank as: the use of simple lending procedures; the expansion of the branch network; the introduction of mobile banking units and group lending; the close cooperation with local governments and mass organizations (including the Vietnam Farmers' Union and the Vietnam Women's Union) in loan disbursement and loan recovery; the introduction of credit rating and classification of borrowers; and the provision of loans without collateral. Regarding the latter, it was highlighted that criteria for loan appraisal were the feasibility of the proposed project or enterprise, the repayment capacity of the borrower and his credit-worthiness. Ownership of assets was only of secondary importance.

The speaker then turned his attention to fisheries lending, which had increased from VND3 363 billion in 2000 to VND12 096 billion in 2005. Sixty-eight percent of this lending had gone to households and individuals, 22 percent to small and medium enterprises and 10 percent to state-owned enterprises. Fifty-nine percent of the total fisheries lending was short-term, while 41 percent was medium and long-term. The speaker estimated that in spite of the increase in lending for fisheries and aquaculture, the bank met only half of the actual demand of this sector for medium and long-term loans. The bank tries to mobilize additional funds from foreign and domestic sources to overcome this constraint. He pointed out that while fisheries and aquaculture could be very profitable, there were also many risks involved. Major constraints were identified as inadequate vocational training opportunities for those involved in fisheries and aquaculture, and in many areas, inadequate processing, transportation and marketing facilities.

Mr Nguyen Viet Tuc concluded his presentation by explaining that a future expansion of lending to fisheries and aquaculture had to go hand in hand with training and technical guidance in fish farming, processing, distribution and export marketing methods and techniques.

The presentations of representatives of APRACA member institutions were followed by a presentation of Mr Raymon van Anrooy, Fishery Planning Analyst at FAO headquarters, on the linkage between microfinance and insurance in inland fisheries. The speaker started his presentation by identifying major risks affecting inland capture fisheries and its development, and by explaining how insurance can contribute to sustainable inland fisheries development. He listed a range of insurance services that could be of support to inland capture fisheries, focusing on loan and vessel insurance. He then listed the main constraints to and opportunities for the development of insurance services. The opportunities include, among others:

- enhanced regulation and better governance of inland fisheries, together with the drive for better inland fisheries management, which should reduce risks;
- evidence that the organizational level of fishers in groups, cooperatives and associations is increasing in some Asian countries, making it easier to reach fishers;

- increased awareness among fishers of the benefits of insurance services through products from life and health insurance companies, causing a potentially higher demand for other insurance services;
- the expansion of communication technologies (internet and cell phones) in rural areas, which decreases costs of communicating with insurance policy-holders, including fishers;
- the introduction of mutual fisheries insurance schemes in more Asian countries following the successful Japanese example;
- innovations in fishing techniques and equipment, which tend to decrease the risks of poor catches such as the use of fish finders and the Global Positioning System (GPS).

Mr van Anrooy continued by explaining already existing and potential linkages between microcredit and insurance in fisheries, such as loan insurance to guarantee that the credit institution is repaid even in case of disasters, and the inclusion of insurance premiums as a percentage of loans for fishing vessels and gears. The speaker also highlighted that through insurance services, major natural disasters affecting fisheries may be made more visible to governments, thus assisting fishers in obtaining financial support and compensation for losses from them, making it easier to repay loans. The speaker then went on to emphasize the important role that fishery cooperatives, SHGs and associations can play in providing microfinance and insurance services.

He added that there is a great similarity of services between credit and insurance institutions. He argued that they could work together in demand and needs assessments, the promotion and marketing of services, the use of common agents and representatives at the village level to increase the spread of services, sharing costs of administrative networks, and carrying out joint capacity building and training of agents and representatives. Mr van Anrooy mentioned, however, that such joint activities are unfortunately rare in the Asian region, especially as far as services for inland capture fisheries are concerned.

The speaker ended his presentation with some recommendations for those involved in providing financial and technical services to the inland fisheries sector. These included: the need for awareness raising and capacity building in inland fisheries insurance among fishers, fisheries extension officers and insurance companies; the need for policies and regulations in support of fisheries insurance development; increased collaboration between microfinance, credit, insurance and fisheries institutions in the fields of data and information exchange; the use of existing networks of agents to reach out to inland fishers; and the need to develop and promote risk management measures for inland capture fisheries.

The afternoon session commenced with a presentation of Mr Chen Daqing, Vice-President of the Yangtze River Fisheries Research Institute, on ecological fisheries development and microcredit support at Zhangduhu Lake. The speaker provided an overview of fish production and fisheries management at the lake. He pointed out that from 1992 to 2002, the lake was managed by the State Fish Farm. The fish production method was extensive fish culture by stocking and the natural growth of fish, supplemented by fishery resources enhancement. The actual fish farming in the lake was carried out by individual households under contract with the State Fish Farm.

The speaker went on to identify the main constraints to a sustainable development of inland fisheries at Zhangduhu Lake as: the poor educational level of fishers resulting in a lack of understanding of management needs and requirements; the eutrophication and pollution of the lake's water caused by an excessive use of fertilizers; increasing fishing pressure; and the separation of the lake from the Yangtze River. Other main constraints were the reduction of the diversity of the fish fauna in Zhangduhu Lake, with the fish population dominated by stocked fish species and a larval recruit population basically dependant on stocking, and difficulties of obtaining credit and finance for various fishery-related purposes.

A description of actions taken to rehabilitate the ecology and fishery of the lake followed, which was supported by substantial funding from the World Wide Fund for Nature (WWF). Actions included efforts to: re-link the Yangtze River with Zhangduhu Lake; reduce the use of fertilizers for aquaculture; protect aquatic plants; enforce and expand closed fishing seasons; establish conservation zones that are closed to fishing year round; introduce fishing licence regulations and fishing quotas; eliminate harmful fishing gears, intensify stocking of the lake with madrine fish, Chinese bream, silver carps, bighead carp, grass carp, black carp; and limit the development of cage culture.

The speaker also mentioned training, micro-enterprise and alternative livelihood development programmes as well as credit programmes for fishers, which were implemented as part and in support of the above measures. This included training and extension programmes in support of growing bamboo and lotus plants in ponds, tea production and processing, vegetable and mulberry tree plantation, silkworm cultivation and other alternative livelihoods. Fishers were also oriented towards culturing high-quality and high-price fishes such as wuchang fish and huangshang fish, in a sustainable and environmentally friendly manner.

Mr Chen Daqing then explained the principles that guided the micro-credit and revolving fund programmes that were introduced for fishers at the lake by the World Wide Fund for Nature, local banks and governments. He elaborated on the purposes for which credit was available, borrowers' responsibilities and credit ratings, repayment modalities and periods, and on loan use supervision. Loan repayment was reported as satisfactory.

The speaker concluded his presentation by pointing out the success of the credit programmes, which have enabled fishers to take up alternative livelihood activities, reduce fishing and fish farming pressure in the lake, and adapt sustainable fishing and fish farming measures. Further, they have motivated fishers to more actively participate in fisheries management and comply with fisheries management regulations.

The last presentation was given by Mr Benedicto Bayaua, Secretary-General of APRACA. The speaker commenced his presentation by an overview of the general characteristics of rural fishing communities and of the external and internal factors that influence these characteristics, such as globalization, coastal tourism, water pollution, overfishing and the use of harmful fishing methods and chemicals.

This was followed by an explanation of the general principles of rural finance and the role of the government and private sector. The speaker highlighted the need for community asset creation in fishing communities as a precondition for improving their access to institutional credit.

Governments should:

- create a policy environment conducive to rural finance;
- provide technical assistance and institution-building resources to rural financial institutions;
- provide the necessary resources for infrastructure support in rural areas;
- support research and development activities in the fishery sector;
- implement measures and issue regulations and legislation;
- facilitate the provision of social services for poor fishing communities.

The private sector was also seen as source of funds for capacity building of rural financial institutions and of technical assistance and expertise. The presentation continued by elaborating on the role of groups in rural credit and savings mobilization programmes, the process of group formation, and capacity building and training. The roles played by NGOs, reputable voluntary organizations, SHGs and rural financial institutions in these processes were explained. The speaker also touched upon collateral substitutes, compulsory and voluntary savings.

The presentation continued by drawing the attention of the audience to an emerging driver of change in rural finance – the transformation of NGOs into microfinance

institutions (MFIs). Examples were provided of how clients such as fishing communities can graduate to mainstream banking through value-addition carried out by individual or group enterprises and through new marketing linkages to domestic and export markets.

The speaker concluded that rural credit and microfinance suited the needs of fisherfolk and that credit must go hand in hand with training and extension support. He also stressed that rural credit should always be accompanied by savings. The speaker further stressed that rural financial institutions should tailor their financial services to the needs of fishing and fish farming communities by better and more realistic information-gathering, better and more useful monitoring schemes, and by a better and more focused compilation of success factors. The Secretary-General of APRACA concluded his presentation by narrating two success stories of microfinance service provision to fisherfolk in Thailand.

Working group session 1: constraints to development and sustainable use of inland fishery resources

After the break, the participants divided into three working groups to discuss the constraints to the development and sustainable use of inland fisheries, and to identify opportunities for improving the management and development of inland fisheries. Group 1 was asked to concentrate on riverine systems, Group 2 on lakes and reservoirs, and Group 3 on floodplains. The working groups were requested to divide the constraints and opportunities into: (i) legal/policy; (ii) institutional; (iii) resources, environment and management; (iv) production (capture techniques/technologies); (v) investment, credit and insurance; (vi) marketing/processing and (vii) infrastructure constraints.

Working group session, conclusions and recommendations – Day 3

Mr Upare was requested to chair the third day of the workshop, which started with each group's presentation of their output, as summarized below.

Issues, constraints to and opportunities for the development and sustainable use of inland fisheries

Issues	Constraints	Opportunities
Riverine systems		
Legal/policy	• Lack of decisions by governments on priorities; • Lack of uniform code of conduct for the management of riverine fishery resources; • Lack of suitable laws and rules for riverine fisheries management;	• Mainstreaming of fisheries into national development policy frameworks;
Institutional	• Lack of coordination between the various institutions supporting fisheries; • Lack of administrative and legal powers of institutions involved in fisheries; • Lack of independent fisheries management authorities; management authority often embedded within agriculture and rural development administration; • Limited staff capacity and funds available for inland fisheries within fisheries administrations compared to aquaculture and marine fisheries; inland fisheries cooperatives largely not efficient and often not delivering the services required by members;	• Better coordination of institutions concerned with fisheries; • Institutional programmes to include capacity building and social welfare measures;

Issues	Constraints	Opportunities
Resources, environment, management	• Suitable apportioning of water resources for fisheries not done – the agricultural sector dominates water use; • Indiscriminate release of pollutants and effluents from agriculture; deteriorated water quality from industry and domestic sources; • Little attention paid to biodiversity conservation and habitat restoration; • Lack of application of concept of river basin management commissions; • Lack of protected areas and biosphere reserves in riverine systems for conservation of biodiversity; • Lack of enforcement of rules and regulations under fisheries acts;	• Habitat restoration and maintenance of water quality of riverine systems; • Co-management and other participatory management modalities;
Production	• Gradual decline of fish production in riverine systems; • Several fish species becoming endangered; • Commercially important species declining rapidly and catches dominated by low-value fish species; • IUU fishing and destructive fishing practices; • Lack of technological innovation in inland fisheries; • Anthropogenic pressure on riverine ecosystems and degradation of ecosystems through damming, water abstraction, deforestation of catchment areas, pollutants and other activities; • Increase of inland fishers through the rural poor taking up fishing;	• Establishment of user rights of river resources for long-term uses; • Investment in research and development of fish capture technologies;
Investment, credit, insurance	• Lack of investment by governments in riverine fisheries development; • Credit and insurance programmes with few success stories, limited, and on a pilot scale only; • Lack of collateral for accessing credit schemes;	• Investment, credit and insurance services to be directed to the poor; • Initially subsidized insurance schemes to be introduced, focusing on the poorest;
Marketing, processing	• Poor market linkages in inland capture fisheries sector; • Lack of innovation in product development of inland fisheries products; • Limited bargaining power of inland fisherfolk;	• Measures to increase access of fishers to credit for fish marketing and processing;
Infrastructure	• Lack of landing centres with support facilities, such as ice plants, cold storage, communication and transport facilities; • Limited processing facilities near landing sites;	• Post-harvest infrastructure to be given priority;
Lakes and reservoirs		
Legal/policy	• Weak laws and regulations, particularly on fishing operations; • More emphasis on aquaculture; none on capture fisheries;	• FAO Code of Conduct for Responsible Fisheries (CCRF); • CCRF Technical Guidelines on fishing operations and fisheries management, which are available and can be followed; • Well-established institutional framework on fisheries policy that can provide support;
Institutional	• Lack of coordination in a multi-agency approach; • Multiple use of water sources;	• Available funds for appropriate coordination of agencies; • Available, experienced staff for coordination and proper management of water resources;

Issues	Constraints	Opportunities
Resources, environment, management	• Habitat destruction; • Overexploitation of resources; • Spread of invasive alien species; • Rapid biodiversity loss; • IUU;	• Laws and regulations; • Constant dialogue and stakeholder consultation; • Enabling environment for community-based management strategies: • Established research institutions; • Experienced staff;
Production	• Use of small mesh sizes; • Use of destructive fishing gears; • Lack of awareness about sustainable use of resources;	• Laws and regulations; • Frequent stakeholder consultation; • Involvement of community in management of resources;
Investment, credit, insurance	• Reluctance of financial institutions; • Low priority for investment by government; • Lack of insurance services; • High risk;	• Existence of well- established financial institutions; • Strong back-up from NGOs; • Limited funds available;
Marketing, processing	• Unorganized marketing system; • Lack of processing facilities; • Lack of awareness about sustainable use of resources;	• Availability of minimal infrastructure and facilities; • Availability of labour; • Availability of experienced staff; • Established marketing associations, groups, companies;
Infrastructure	• Lack of infrastructure due to remoteness; • Limited funds; • Low priority area; • Minimal facilities; • Poor road and communication networks;	• Established institutional framework; • Available labour force; • Experienced staff;
Legal/policy	• Weak conservation; • Conflicts among local governments;	• Ecologically- and ecosystem-friendly; • General guidelines and standard on fish species and sizes; • Long-term lease (10 to 15 years);
Floodplains		
Institutional	• Inadequate coordination; • Inadequate data and statistics; • Differences between institutions and local governments; • Differences between policies; • Conflicts between marine and inland fisheries; • Relocation of fish farmers;	• Creation of new employment; • Limited resources with low population pressure facilitating management and the provision of training and technology; • Improvement of efficiency;
Resources, environment, management	• Depletion of resources; • Environmental degradation; • Pollution; • Loss of habitats; • Reduction of area; • Lack of authority to enforce regulations;	• Improvement of environment through policies that reduce pollution;
Production	• Unsophisticated technologies for capturing fish; • Destruction of nets; • Financial problems due to lack of information;	• Investment in more sophisticated fishing technology;
Investment, credit, insurance	• Higher risk and less income compared to other fishery sectors;	• Government policy promoting lending to fisheries sector;
Marketing, processing	• Lack of information on marketing systems; • Problem of freshwater fish processing; • Poor processing technology;	• Easy access to information via internet;
Infrastructure	• Ports and roads in rural areas; • Storage problems; • Lack of transport facilities for live fish.	• Infrastructure financing for vessels, transportation.

Working group session 2: guidelines for meeting credit and microfinance needs in inland capture fisheries development and conservation in Asia

After the morning break, the participants returned to their working groups to discuss draft guidelines for meeting credit and microfinance needs in inland capture fisheries development and conservation in Asia, which had been prepared by the organizers of the workshop. Each group was asked to discuss designated chapters and make modifications, additions and revisions to the draft text; which was prepared based on the case studies shown in Part 3 of this publication and following the FAO Guidelines on Microfinance in Fisheries and Aquaculture. The working group outputs were presented after the lunch break. (The final text of the guidelines as amended by the working groups is provided in Part 1.)

2.3 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions were discussed and agreed on by the participants during the concluding plenary session.

- Inland waters are important for food security, livelihoods and income generation of large populations in Asia and for biodiversity.
- Inland waters have many uses competing with each other, and often the fisheries sector has very little influence in decision-making regarding their use. The inland fisheries sector often receives insufficient attention in national fisheries policy frameworks and in general national development plans.
- Rehabilitation of the inland aquatic environment for natural fish production should be done in conjunction with microfinance programmes. Microfinance alone would not solve the problem of poverty in fishing communities.
- Microfinance benefits the poor by increasing income-earning opportunities, securing livelihoods, decreasing vulnerability, and empowering beneficiaries, especially women. To date, microfinance for inland fisheries has been primarily directed towards aquaculture activities. Inland capture fisheries as well as processing and marketing of inland fisheries products have received little attention from microfinance schemes in the region.
- A clear distinction should be made between inland capture fisheries and aquaculture. A monitoring system for microfinance and credit should be established that distinguishes between inland capture and aquaculture, as well as other subsectors. At present, it is not possible to measure the contribution of microfinance towards improving the livelihoods of inland capture fishers.
- It is still not easy for small-scale fishers in many Asian countries to access credit. This is generally not a result of limited availability of funding, but lack of information on the needs of fishing communities. Moreover, there is a lack of awareness among fishing communities about microfinance services.
- There is a lack of timely dialogue and coordination among the various international, national and local institutions supporting and/or impacting on inland fishery resources. An integrated multi-stakeholder approach to inland fisheries development and management is generally lacking. Public-private partnership arrangements are emerging in the management of some dams and reservoirs in Asia.
- It has been noticed in several Asian countries that dams are particularly deleterious to fisheries because they interrupt the longitudinal migration of fish.
- International agreements and guidelines such as the CCRF, the CCRF Technical Guidelines and the Convention on Biological Diversity (CBD) relevant to inland fisheries development are often not complied with at the national level. It was recognized that inland capture fisheries concerns are given a low priority in international fora.

- Co-management was presented as a feasible option in saving inland fish species from extinction and in restoring fish populations. Microfinance is considered a means to strengthen community-based or co-management systems.
- Many microfinance and insurance schemes directed towards inland fisheries can still be regarded as being in a pilot phase. Success stories and formulas have not yet been widely disseminated.

The following recommendations were discussed and agreed on by the participants during the concluding plenary session. The participants resolved to include a preamble to the draft guidelines for meeting credit and microfinance needs in inland capture fisheries development and conservation in Asia, which were discussed in the working groups. They also agreed to attach the guidelines to the workshop recommendations.

National governments

- Inland capture fisheries should be mainstreamed into national economic development policy frameworks.
- A fishery finance policy framework should be put in place in support of sustainable inland fisheries development. Lending to the inland capture fisheries sector should be encouraged.
- Appropriate financing mechanisms for inland capture fisheries should be devised.
- Rehabilitation and restoration of the inland aquatic environment for natural fish production and improvement of water quality should be done in parallel with microfinance.
- International agreements and guidelines, e.g. the CCRF, the CCRF Technical Guidelines and the CBD relevant to inland capture fisheries development should be complied with and enforced.
- The necessary infrastructure should be put in place in support of inland capture fisheries production and post-harvest activities.
- Capacity-building and skills enhancement programmes should be designed and implemented for poor inland capture fishers.

Financial institutions

- A monitoring system for microfinance and credit disbursements should be established that distinguishes between inland capture and aquaculture or other subsectors.
- Financial institutions are encouraged to reach out to inland fishing communities and facilitate access of poor fishers to microfinance and insurance services.
- The guidelines for meeting credit and microfinance needs in inland capture fisheries development and conservation in Asia should be followed and implemented.
- Microfinance institutions should design services that are tailored to the needs of poor inland fishers.
- Small regular savings promoting economic empowerment should be a built-in component of microfinance programmes.

International/regional organizations and donors

- FAO should take an advisory role in inland fishery resources management, and encourage and assist national governments in establishing river basin commissions to ensure that institutional arrangements in all areas of the river under different administrative jurisdictions are consistent and non-conflicting.
- Fishing communities and their associations need access to loans for the rehabilitation of fish habitats and fish stock enhancement. International and regional institutions such as FAO and APRACA should act as catalysts to encourage financial institutions to make loans available for such purposes.

- Donors and international financial institutions should assist the inland capture fisheries sector through the provision of guarantee funds in support of the implementation of inland fisheries management measures.
- International and regional institutions should act as facilitators between microfinance institutions and the fisheries sector.
- A regional or international workshop should be organized to bring all stakeholders from various sectors together to discuss the effects of dams on fish and fisheries.
- A regional workshop should be organized on the promotion of inland capture fisheries and aquaculture insurance in Asia.
- International and regional organizations and donors should promote capacity building and skills enhancement in microfinance for poverty alleviation and the sustainable use of inland capture fishery resources.

Fishers

- Fishers should organize themselves to take better care of their interests at all levels. Their organizations, associations and SHGs can act as financial intermediaries and guarantors of loans from microfinance institutions. Fishers should take responsibility for the sustainable management and well-being of inland fishery resources and fishers.

Non-governmental organizations

- NGOs should strengthen their role in creating awareness on inland capture fisheries and the ecosystem in which fisheries activities take place, and in promoting dialogue among the different stakeholders at international and national levels for better management and development of the sector.
- NGOs can play a crucial role in all capacity-building and training aspects related to community-based management of inland fishery resources, the formation and operation of SHGs and producer associations, management of microfinance programmes, as well as in technical training related to development of small and medium-scale fishery enterprises.

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ANNEX 2. PROGRAMME OF THE BEIJING WORKSHOP, 2006

14 February 2006	
8.00	Registration
9.00	Opening ceremony Welcome addresses by representatives of the Fisheries Bureau, Ministry of Agriculture, China; the FAO Representation in China; the Fisheries Department, FAO Rome; the East China Sea Fisheries Research Institute and the Chinese Academy of Fishery Sciences Introduction of participants
11.00	Break
11.15	Background and objectives of the workshop, by Mr Gerd Marmulla, Fishery Resources Officer, FAO Rome
11.30	*Presentation of country case studies* Chair: Mr Benedicto Bayaua Rapporteur: Mr Raymon van Anrooy China: Dr Xie Yingliang/Zhu Decheng: *The potential for inland fisheries development and rehabilitation and supporting credit/microfinance programmes at Lake Luoma*
12.15	Lunch
14.00	Myanmar: Ms Nu Nu Aye/Mr Khin Maung Win: *Institutional credit and microfinance sources in Myanmar with special reference to livelihoods in Lake Inlay, Southern Shan State*
14.45	India: P.V. Dehadrai: *Management challenges regarding riverine fisheries and fishers in India*
15.30	Break
15.45	India: Mr M.A. Upare: *Credit and microfinance programmes on inland capture fisheries in West Bengal and Assam State, India – a case study*
16.30	Cambodia: Mr Heng Sotharith: *Increasing inland fisheries production and livelihood security in Cambodia through aquaculture and supporting credit/microfinance programmes – risks and prospects*
15 February 2006	
9.00	Chair: Mr Huang Shuo Lin Rapporteur: Ms Susana V. Siar China: Dr Xie Xiangling/Yan Xiaomei: *A success story of inland fisheries development and rehabilitation, and supporting credit/microfinance programmes at Lake Taihu*
9.45	Malaysia: Ms Hjh Mahyam Mohd Isa: *Successful involvement of local communities in conservation programmes of Malayan Mahaseer in River Kinabatangan of Sabah State*
10.30	Break
10.45	Presentations from APRACA member institutions on credit and microfinance programmes in Indonesia, Viet Nam and Thailand
11.30	Mr Raymon van Anrooy, FAO Rome: *Linkages between microfinance and insurance in inland fisheries*
12.00	Discussion
12.15	Lunch
14.00	Mr Chen Daqing: *Ecological fisheries development and micro-credit at Zhangdu Lake*
14.30	APRACA: Mr Benedicto Bayaua

15.30	Break
15.45	Working group session: constraints to and opportunities for the development and sustainable use of inland fisheries
16 February 2006	
9.00	Chair: Mr Upare Rapporteur: Mr Gerd Marmulla Presentation of working group reports
10.30	Break
10.45	Working group session: Recommendations and guidelines for credit and microfinance programmes in support of the sustainable use of inland fishery resources and poverty alleviation
12.30	Lunch
14.00	Presentation of working group reports
15.00	Break
15.30	Discussion and finalization of workshop conclusions
16.00	Discussion on and finalization of recommendations and guidelines for credit and microfinance programmes in support of sustainable use of inland fishery resources and poverty alleviation
16.30	Closing session: closing remarks by representatives of the East China Sea Fisheries Research Institute and the FAO Fisheries Department
	17 February 2006
8.30	Field visit

ANNEX 3. WELCOME ADDRESSES

Welcome address of Mr Liu Zheng, Vice-Director of the Bureau of Fisheries of the Ministry of Agriculture of China

Ladies and gentlemen, dear friends,
Having just celebrated the biggest Chinese festival, the Spring Festival, Chinese people all over the world are still immersed in a festive atmosphere of peace, harmony and happiness. In such a favourable atmosphere, we gather here in Beijing for the opening ceremony of the FAO Regional Workshop on Guidance for Credit and Microfinance Programmes in Support of Sustainable Use of Inland Fishery Resources and Poverty Alleviation. First, please allow me, on behalf of the Bureau of Fisheries of the Ministry of Agriculture of the People's Republic of China, to extend my heart-felt congratulations on the convening of this workshop. I would also like to warmly welcome all the participants and guests, wishing all of you good health and a Happy New Year.

As a mainstay of agriculture, the fisheries sector plays an important role in ensuring food security and improving the quality of life of the community. For a long time, countries in the Asia and the Pacific region have made remarkable achievements in advancing fisheries development. But we are still facing some big problems and challenges imposed by nature, the economy and social factors. We should attach great importance to strengthening cooperation and joining efforts to improve the overall status of inland fisheries.

China is an important country for both the production and the consumption of fish products. In order to ensure a sustainable development of fisheries, the Chinese Government has always geared itself towards improving fish products and increasing the income of fishers. Over the years, we have persistently adhered to the fisheries development policy of giving priority to aquaculture, paying equal attention to raising, harvesting and processing fish and ensuring that development takes place in accordance with local conditions. By adjusting our production in response to markets and actively advancing the adjustment of the structure of the fishery industry, we have developed the capacity of fish production and enhanced the management of fishery resources, ecology and the environment, and aquatic product quality and safety, as well as the import and export trade. For many years, Chinese fisheries and the fisheries economy have maintained a positive trend of development.

In 2004, Chinese aquatic production amounted to 49.02 million tonnes, including 21.34 million tonnes of inland products. Regarding inland aquatic products, the capture fisheries production reached 2.42 million tonnes, representing 11.34 percent of the total, while the inland aquaculture production was 18.92 million tonnes, representing 88.66 percent of the total. Classified by species groups, finfish production was 18.93 million tonnes, crustacean production, 1.53 million tonnes, and the shellfish production, 0.53 million tonnes. Chinese imports and exports of aquatic products amounted to 5.41 million tonnes, with a total value of US$10.2 billion.

Being among the countries with the largest inland water areas, China's inland water area is 18.38 million ha, covering 1.8 percent of our total land area. Of the total Chinese inland water areas, rivers cover 7.65 million ha and account for 39 percent of the total inland water area. There are 24 000 natural lakes, covering 7.14 million ha and accounting for 42.4 percent of the total inland water area; 83 000 reservoirs with an area of 2.11 million ha, representing 11.9 percent of the total water area; and ponds with a total area of 1.48 million ha, which occupy 13.8 percent of the total inland water area. China owns abundant inland water aquatic resources, including 709 species and

58 subspecies of freshwater fishes, 64 species of migratory fishes and some crustacean, shellfish and amphibian resources.

Great progress has been made over the years in Chinese inland fisheries, which play an important role in ensuring food supplies and food security, by increasing the income of fish farmers and fishers. But with the rapid development of industrialization, continuous growth of the population and overexploitation of water resources, there are still some limiting factors to their development. The main threats to sustainable inland fisheries development in Asia were identified as: the reduction of survival space and the modification of the habitats of fish and aquatic organisms; pollution of water bodies and aquatic environment; the degeneration of fish germplasm; local conflict in the management and utilization of migratory fish stocks. Other main threats were the lack of capital needed for the development and rehabilitation of inland fisheries, and related to this, the lack of awareness of financial institutions of the investment and credit needs of inland fisheries.

In view of the current status of Chinese inland aquatic resources and environment, the Chinese Government has adopted a series of measures to ensure sustainable development of fisheries. The State Council has issued regulations for the protection of aquatic resource breeding in the form of a protocol drafted by the Ministry of Fisheries in 1964 and put into practice in February 1979. Later, the Chinese Government enacted the Law of the People's Republic of China on the Protection of Water Pollution (1984), the Law of the People's Republic of China on Fisheries (1986) and its revision (2000), the Law of the People's Republic of China on Environmental Protection (1989) and Regulations of the People's Republic of China on the Protection of Wild Animals (1993).

Yangtze River, known as the "Mother River of China", has a total length of 6 300 km and flows through ten provinces of the country. In order to protect and rehabilitate fishery resources in Yangtze River, the Chinese Government has implemented regulations regarding closed fishing seasons in the river on the basis of trials conducted in the spring of 2002. Fishing is not allowed from 1 January to 30 April upstream of the Gezhou Dam and from 1 May to 30 June downstream of the Gezhou Dam. At the same time, stocking programmes were expanded. Other management measures are: controlling the efficiency of fishing boats and fishing efforts; managing fishing licences; introducing closed seasons in large rivers and lakes; monitoring the environment and water pollution; rehabilitating river and lake ecology and environment; protecting aquatic plants and animals; breeding and releasing important aquatic species; and setting up protective measures for species in severe danger. All these measures play important roles in protecting the ecology and environment of inland fisheries, conserving and enhancing aquatic resources, promoting the sustainable utilization of inland fishery resources, and increasing the income of fishers.

Officials of the Fisheries Department of FAO, the General-Secretary of APRACA, and government officials, and fisheries and finance experts from India, Malaysia, Cambodia, Myanmar, Viet Nam, Thailand, Indonesia, and inland fishery management leaders and experts from China have been brought to Beijing through the convening of this workshop. All of us gather together here to discuss matters of common concern. This will also give us an opportunity to learn from our guests and provide insights in the development of Chinese inland fisheries.

I believe that the fisheries departments of countries in the Asia and the Pacific region will attach greater importance to the sustainable utilization of inland fishery resources after this workshop. The Chinese Government has always been concerned with sustainable utilization of inland fishery resources and the increase of income of inland fishing communities. Many programmes for developing the rural economy and improving farmers' income were implemented to sustain agriculture and fisheries through policy and financial measures in order to solve the problems of our country's

rural areas, agriculturists and farmers. China strives for even greater achievements by promoting a healthy environment, building a harmonious society and further developing its inland fisheries with support from FAO and through the joint efforts of the countries in Asia and the Pacific region.

Dear friends, ladies and gentlemen!

Let us join hands and make joint efforts to improve cooperation in the development of fisheries in the Asia and the Pacific region and to achieve the global aim of fisheries development. At the same time, I wish everyone a pleasant stay in Beijing. I also wish the workshop a complete success!

Thank you!

Welcome Address of Dr Noureddin Mona, FAO Representative in China, DPR Korea and Mongolia

Mr Chairman, distinguished guests, ladies and gentlemen,

Good morning!

On behalf of FAO, I have the privilege to warmly welcome you to this Regional Workshop on Guidance for Credit and Microfinance Programmes in Support of Sustainable Use of Inland Fishery Resources and Poverty Alleviation. I should like to express our appreciation to the China Society of Fisheries for generously hosting and co-sponsoring this workshop.

FAO's mandate is to raise levels of nutrition, improve agricultural productivity, better the lives of rural populations and contribute to the growth of the world economy. Achieving food security for all is at the heart of FAO's efforts. The reduction of food insecurity and rural poverty, and the promotion of sustainable rural livelihoods and more equitable access to resources are major strategies within FAO's strategic framework for 2000 to 2015. Strong and poverty-focused fisheries development is one of the contributors to the successful implementation of these strategies. FAO's major programme on fisheries aims to promote sustainable development of responsible fisheries and to contribute to food security.

Fish is a key ingredient in the global menu, a vital factor in the global environmental balance and an important basis for livelihoods worldwide. In Asia, fish is a source of "rich food for poor people" and can play an important role in improving people's food security and nutritional status. It needs to be placed where it belongs – high on the global, regional and national agenda, and integrated into thinking, action and policies at the highest levels by all nations.

Inland fishery resources in the region are noted for their variety, biodiversity, rich ecological heritage and production potential. As this region produces almost half of the world's total capture fisheries production from inland waters, inland fisheries have the potential to contribute even further to pro-poor growth and poverty reduction in several ways: through local enterprise development, and regional and international trade.

In less than 50 years, the world's average per capita consumption of fish has almost doubled. As the overall demand for an adequate supply of fish continues to increase, we are forced to face the fact that this level of demand may not be met. Trying to meet it may cause long-term, irreversible damage to the environment and limit the future options of many people.

Asian countries have been working hard to improve regional cooperation and national capacities to develop a more integrated approach to managing inland fishery resources. There is still a tremendous scope for increasing technical and financial support to responsible inland capture fisheries development and rehabilitation in Asia. In particular, increased capital input and financial institutions' awareness of

the investment and credit needs of inland fisheries are deemed crucial. Cooperation between stakeholders, local management authorities and government bodies and financial institutions should be strengthened.

This workshop is organized to facilitate this process. In the next four days, the distinguished participants will exchange their experiences, views and ideas. It is my wish that the workshop will result in specific and pragmatic recommendations for national governments, financial institutions, stakeholders and fisheries administrations.

Before I conclude, I would like to thank you all on behalf of FAO for accepting our invitation to participate in this workshop. I also wish that your deliberations will be successful and I can assure you of FAO's full support to further your country programmes on inland fisheries development.

I wish a pleasant stay to all foreign friends and wish the workshop the best of success.

Thank you.

Welcome address of Dr Susana Siar, Fishery Industry Officer, FAO Rome

Distinguished participants in this regional workshop, ladies and gentlemen,

Good morning! On behalf of the Fisheries Department and my colleagues who are present here today, I would like to express our warm appreciation to the China Society of Fisheries and the East China Sea Fisheries Research Institute for organizing this workshop and providing excellent arrangements.

The mission of the FAO Fisheries Department is to facilitate and secure long-term sustainable development and utilization of the world's fishery resources and aquaculture. By these we mean: meeting global and national food security objectives; alleviating poverty and sustaining livelihoods; and contributing to national and international trade. FAO implements its fisheries mission through a range of different but interrelated activities, such as information dissemination, objective and neutral policy advice, methodology development and adaptation, technology transfer, technical assistance and capacity building.

One of the major activities of the FAO Fisheries Department is the formulation of guidelines and extension materials for micro-enterprise and microfinance development in support of poverty alleviation in small-scale fishing communities and the pilot-testing of these materials in close cooperation with fishing communities, fisheries development agencies and NGOs. Since 1989, the FAO Fisheries Department has been providing guidance on credit programmes for fishing communities with the publication of *Management guidelines for revolving loan funds and credit programmes for fishing communities* (Dorsey, Ryhanen and Tietze, 1989). The importance of microfinance as a crucial development tool for poverty reduction was reinforced with the passage of the United Nations General Assembly Resolution 52/194 on 18 December 1997, which noted that in many countries, microcredit programmes have succeeded in generating productive self-employment by providing access to small capitals for people living in poverty.

Experiences of microfinance institutions have shown that there is a demand among the poor for savings, deposit, insurance and loan services, and when they do obtain access to these, they are able to save and repay their loans. Microfinance has made a difference in the lives of many poor women, whose engagement in micro-enterprises has led to increased well-being for their families and a sense of empowerment. Microfinance provides livelihood options for many fishing households and helps reduce their vulnerability.

Beginning in 2002, the FAO Fisheries Department has organized regional workshops with the objective of drawing conclusions from recent experiences with microfinance

programmes in fisheries and aquaculture in Asia. In December of last year, the Executive Committee of the Asia Pacific Rural and Agricultural Credit Association, which is represented here today, and representatives from the Agriculture and Fisheries Departments of FAO held a dialogue on how we can strengthen the relationship between FAO and APRACA, and work together in areas of common concerns, one of which is in the field of microfinance for fishing communities. This regional workshop is devoted to credit and microfinance programmes in support of the sustainable use of inland fishery resources and poverty alleviation.

In many countries, inland fisheries are important for providing food and income for many households dependent on fishing and post-harvest activities. At the 26th Session of the Committee on Fisheries in March 2005, it was observed that inland fisheries need to be accorded greater attention, and proposed that specific policy interventions in support of these fisheries should be identified. This regional workshop gives us the opportunity to formulate recommendations and guidelines for credit and microfinance in support of the sustainable use of inland fishery resources and poverty alleviation, which would be useful to many countries in Asia.

My colleagues and I are looking forward to the active participation of everyone and to lively and fruitful discussions during these four days. Thank you very much for your attention.

Welcome address of Prof. Chen Xuezhong, Director, East China Sea Fisheries Research Institute, Chinese Academy of Fishery Sciences

Honoured guests from FAO, dear fishery colleagues, dear leaders, ladies and gentlemen,

As a Chinese saying goes: "A new year starts with spring." It is at the time of the Chinese lunar festival season that we gather here in Beijing to hold the opening ceremony of the *FAO Regional Workshop on Guidance for Credit and Microfinance Programmes in Support of Sustainable Use of Inland Fishery Resources and Poverty Alleviation*. On behalf of our host, I would like to take this opportunity to extend my warm welcome to all participants of this workshop and all guests, and wish you good health and all the best.

Dear participants, in recent years, the Chinese fishery output has increased rapidly under the leadership and care of the government. Aquatic production has increased by ten percent annually, with its value accounting for 11 percent of the gross output value of agriculture. The rapid development of fisheries has met the market's needs and its products play a major role in enriching people's dietary patterns, ensuring food security and agricultural development, and increasing the income of farmers and of the fishing community. We owe all these achievements to the strong support from our government, the progress of fishery science and technology, and also to the wide international exchanges and cooperation in the field of fishery science and technology.

As one of the countries with the largest freshwater areas, China owns 6.84 million ha of river areas. There are 24 000 lakes and 83 000 reservoirs, which provide vast spaces to develop inland fisheries. Chinese inland fisheries have developed greatly since the adoption of the policy of reform and opening up to the outside world. By 2004, Chinese freshwater aquatic products totalled 21.34 million tonnes, accounting for 43.5 percent of the total aquatic production. Preliminary statistics show that these products totalled 22.41 million tonnes in 2005, which accounted for 43.9 percent of the nation's total aquatic products. Inland fisheries have become a main component of the fisheries economy and provide high-quality protein resources for people living in the interior parts of the country. But there are still detrimental factors in Chinese inland

fisheries development, for example, cases of an unreasonable utilization of inland water and aquatic resources, overfishing driven by profit motives, as well as negative effects of overfishing on biological diversity and germplasm protection, and of aquaculture on genetic biodiversity and on the ecology. We should solve these problems from the viewpoint of scientific development, with a pragmatic and realistic attitude and through scientific research.

In light of the current status of inland aquatic resources and environment, the Chinese Government has adopted a series of strategies based on its fisheries development policy to ensure the sustainable development of the fishery industry while following the principle of sustainable development, and protecting and rehabilitating fishery resources, ecology and the environment. In recent years, the Ministry of Agriculture has taken measures relating to the waters of Yangtze River and other big inland lakes based on scientific research, such as: a seasonal ban on fishing in big rivers and lakes; restrictions of the power and fishing efficiency of fishing vessels; the introduction of catch quotas; the limiting of fishing effort in keeping with natural growth; and regeneration of stocks.

At the same time, measures have also been taken by setting up and implementing management mechanisms and action plans to monitor and rehabilitate ecology and the environment, to increase the value of and enhance important aquatic resources, and to protect rare and endangered species from threats. Through implementing these measures and plans, obvious achievements have been made, which in turn have strongly promoted a healthy and sustainable inland fisheries development and increased both the current and future potential income of the inland fishing community.

Dear friends, we feel it is an honour for our institute to host this workshop for FAO here in Beijing together with the China Society of Fisheries. We feel happy to gather here with officials of the Fisheries Department of FAO, the Secretary-General of APRACA and all the experts from both home and abroad to discuss issues of common concern and exchange ideas. As a national institution engaged in fishery research, we take it as our responsibility to carry out measures to protect natural resources and to implement sustainable management measures and responsible fishing practices. I believe that the advanced experiences from the participating countries will greatly benefit the development of inland fisheries in our country. I also believe that under the care and direction of FAO and through the combined efforts of all the experts participating in this workshop, the inland fisheries of Southeast Asian countries will certainly look forward to a harmonious and healthy development.

To end my speech, I wish the workshop a complete success and also wish all participants a pleasant stay in Beijing!

Thank you!

PART 3

Case studies and success stories of credit and microfinance support to inland fisheries development and conservation

I. Potential for inland fisheries development and rehabilitation and supporting credit and microfinance programmes at Lake Luoma, China

By XieYingliang and Zhu Chengde

1. GEOGRAPHY, HYDROLOGY AND USES OF LAKE LUOMA

Lake Luoma is part of the Yihe River system, located on the Huaibei Plain in the north of Jiangsu Province, situated at latitude 34°0'N–34°14'N and longitude 118°6'E – 118°16'E. Lake Luoma is the third biggest lake in the Huaihe River drainage area and lies in the centre of the industrial belt between Xuzhou City and Lianyungang City, with convenient communication links. The lake falls under the joint jurisdiction of Suyuan County and Xinyi City.

The total drainage area of the lake is 50 800 km² and the water area is 260 km² at a water level of 23 m with a corresponding volume of 864 million m³. The average water depth is 3.32 m and the maximum water depth is 5.50 m. The total length of the lake from south to north is 27 km and the average width is 13 km.

The region around Lake Luoma was often subjected to floods and droughts, and historically considered a backward area. From 1949 to 1958, it was transformed into a large reservoir-type lake through the construction of dams and sluice gates. Wheat was planted around the lake during the dry winter season and water was conserved during the rainy season so that it could be used whenever needed.

For many years, the average freshwater runoff into the lake was 7 050 million m³. Its main water sources are the Yihe River, the Zhongyunhe River and the Fangting River. Lake Luoma is connected to the Xinyi River through the Zhangshan sluice gate, to the Zhongyunhe River through the Zhaohe sluice gate, and to the Liutanghe River through the Yanghe sluice gate. There has been a big fluctuation of the water level of Lake Luoma over the years, with an average water level of 22.6 m, a maximum level of 25.47 m and a minimum level of 17.61 m. The maximum annual fluctuation is 5.93 m and the minimum is 1.90 m. The average annual inflow of water into Lake Luoma is 8 280 million m³ and the average annual outflow of water from the lake is 8 400 million m³ with a frequency of water exchange of about ten times a year.

Annually, 1 150 million m³ of waters of Lake Luoma are used for the irrigation of 66 700 ha of farmlands. The lake also supplies water to villages and towns in the vicinity of the lake, which consume annually 42 million m³ for domestic purposes and 22 million m³ of water for industrial purposes.

Lake Luoma has a warm temperate monsoon climate with abundant sunshine and rainfall. The average annual temperature is 13.5 °C; the annual average precipitation is 913 mm; the average annual period of sunlight is 2 500 hours; and the annual frost-free period averages 219 days. These conditions are favourable for the growth of fish and other aquatic organisms.

Fifty-six fish species have been recorded historically in Lake Luoma with *Cyprinidae* as the dominant species represented by common carp, crucian carp,

Xenocypris argentea (Basilewsky), grass carp, black carp, silver carp, bighead carp and *Salangidae and Erythroculter mongolicus* (Basilewsky). In the 1970s, the catch of common carp, crucian carp, *Salangidae and Erythroculter mongolicus* (Basilewsky) accounted for 60 percent of the total catch.

There is also an abundant resource of freshwater shrimps and the annual catch of *Macrobrachium nipponensis* (de Haan) can reach 150 tonnes. A fishing boat carrying 400 shrimp cages caught 12.5 kg/day in 1970. Since stocking crabs of *Eriocheir sinensis* (H. Milne Edwards) in 1972, the annual catch of crabs has exceeded 100 tonnes.

Lake Luoma is divided into the northern lake region and the southern lake region according to water depth and distribution of aquatic plants. There is a shallow area in the northern part of the lake with a sandy bottom and aquatic plants such as *Phragmites communis,* Trin *and Acorus calamus* L. A large quantity of water enters into the lake during the rainy season every year and the areas where the water enters become the breeding ground for *Megalobrama terminalis* (Richardson), *Erythroculter mongolicus* (Basilewsky)and *Erythroculter ilishaeformis* (Basilewsky). In addition, some bottom species such as *Hemibarbus maculatus* (Bleeker) and *Pseudobagus fulvidraco* (Richardson) inhabit these areas.

Benthic aquatic plants are plentiful in the shallow waters along the northwest and the northern lakeshores and there is an abundance of benthic animals such as snails, worms and aquatic insects. These areas are breeding grounds for common carp, crucian carp, *Hemibarbus maculatus* (Bleeker) and other species. *Macrobrachium nipponensis* is also found here. An open area with a water depth of 2-3 m in the southern part of the lake provides habitat for ice fishes, *Erythroculter mongolicus* (Basilewsky), carps and other fishes during winter. *Palaemon (Exopalaemon) modestus* (Heller) and *Corbicula fluminea* (Müller) are also found here.

The composition of aquatic plants and plankton in Lake Luoma is similar to other lakes in Jiangsu Province. The diversity of habitats in the lake not only offers a vast scope for the reproduction of fish and aquatic organisms, but also a broad perspective for the further development of capture fisheries and aquaculture.

Based on an estimation of food biomass at Lake Luoma, the lake has an annual potential for fish production of 5 537 to 7 209 tonnes (see Table 1), which is much higher than present production.

From the late 1970s to the early 1980s, the annual catch of Lake Luoma was about 1 600 tonnes. With the aim of managing and enhancing the fishery resources at Lake Luoma and increasing fish production, a Fisheries Management Committee (FMC) was established in 1986 by the Fisheries Bureau of Jiangsu Province. The roles of FMC include, among others: monitoring the fishery resources and the aquatic environment; preparing and implementing plans for stocking the lake waters with fingerlings; establishing conservation zones and closed fishing seasons; issuing regulations for fishing and aquaculture, fishing licences and fishing quotas; and undertaking routine inspection of fishing vessels at Lake Luoma. The committee is divided into four sections – an administrative and regulatory section, an aquatic resource and environment section, a scientific research section, and a hatchery section.

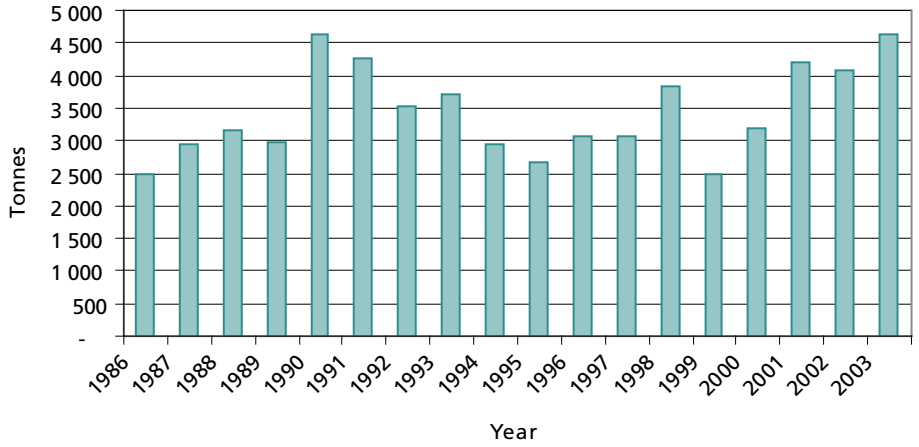
TABLE 1
Estimate of potential for production of food biomass at Lake Luoma (tonnes)

Species	1997	1998
Aquatic plants	2 415.0	2 450.0
Phytoplankton	1 224.8	2 780.0
Zooplankton	1 094.1	899.1
Benthic animals	803.6	1 080.4
Total	5 537.5	7 209.5

Source: Yu Ning and Zhu Chengde, 2000.

As a result of the work of FMC, particularly in the field of fishery resources enhancement and protection, the catch increased to an all-time record high of 4 642 tonnes in 1990, then fluctuated as a result of changing water levels and reached 4 622 tonnes in 2003. Figure 1 shows the annual catch at Lake Luoma since the establishment of the FMC from 1986 to 2003.

FIGURE 1
Annual catch at Lake Luoma, 1986–2003



Source: Statistics from the Fisheries Management Committee of Lake Luoma, 2004.

2. CONSTRAINTS TO A SUSTAINABLE DEVELOPMENT OF INLAND FISHERIES

2.1 Economic backwardness and shortage of funds for the development of inland fisheries

Even though there has been considerable progress and economic development in recent years in Xinyi City, Suyu County and other areas of the Huaibei Plain in Jiangsu Province, this part of China still lags behind other parts of the country as far as economic development is concerned. Xinyi City, for example, ranked only 49 of the 64 counties in Jiangsu Province in terms of economic indicators, and Suyu County ranked 53. In terms of the average annual income per farmer, Xinyi City ranked 48 with an average annual income of only 3 479 yuan[1] per farmer; Suyi County ranked 56 with an average annual income of only 3 170 yuan per farmer.

The annual income of full-time fishers at Lake Luoma increased from 1 650 yuan in 1999 to 4 350 yuan in 2003, and was thus slightly higher than that of farmers. Compared to other parts of China, however, it was comparatively lower. Figure 2 shows that the annual income of a full-time fisher at Lake Luoma was only 60 percent of the annual income of his counterpart at Lake Taihu.

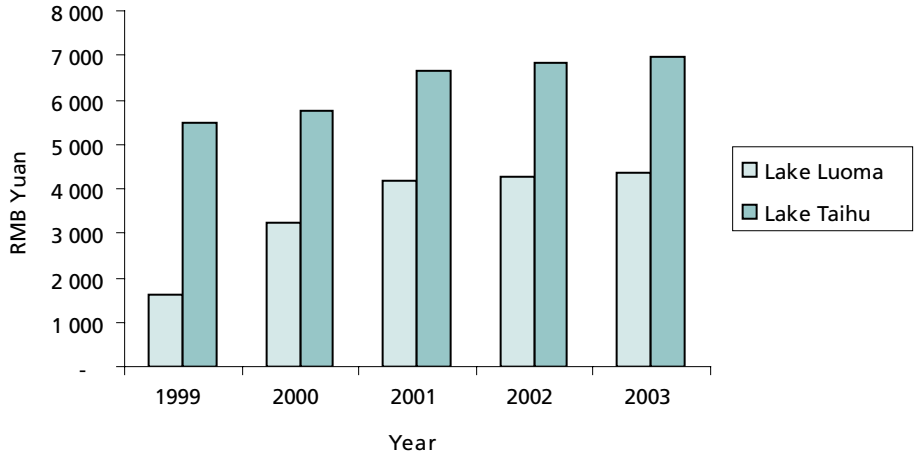
The economic backwardness and the resulting shortage of funds, both of government and fishers, are serious constraints to the development of fisheries at Lake Luoma.

Related to the relative economic backwardness of the lake and its surrounding towns and villages, the fishers and farmers living at the lake have a lower literacy and educational level than in other parts of China. Only half of the farmers and fishers have completed school and about ten percent cannot read or write. Related to the low level of education is a lack of awareness of the need for protecting fishery resources and the environment, and of a long-term view of natural resource uses.

Short-term profit-orientation in the exploitation of fishery resources led to the use of illegal fishing practices, such as poisoning of fish, use of explosives and electro-fishing. From 1995 to 1996, 2 559 cases of illegal fishing were discovered and punished. In 2000, illegal fishing still occurred, 631 cases were discovered and punished, and nine fishing boats engaged in electro-fishing were confiscated. In 2002, 383 cases of illegal fishing were discovered and punished, and 143 sets of electro-fishing gear were confiscated. The education of fishers is still a difficult task, which is essential for raising

[1] 1 yuan = US$0.120779 as of 1 September 2004.

FIGURE 2
Average annual income of fishers at Lakes Luoma and Taihu, 1999–2003



Sources: Statistics from the Fisheries Management Committee of Lake Luoma, 2004 and from the Fisheries Management Committee of Lake Taihu, 2004.

awareness of the need to conserve fishery resources and the environment, and for reducing conflict between fishers using illegal fishing methods, on the one hand, and government personnel protecting the fishery resources and fishers using responsible fishing methods, on the other.

2.2 Floods, droughts, pollution and changes of water level

The large fluctuation of the water level of Lake Luoma has had a strong influence on fish production. The analysis of data shows that the catch was high in years with small fluctuations of the water level of the lake, as in 1991 and 1998, when the annual catch was 4 267 tonnes and 3 823 tonnes, respectively. In years with large fluctuations of the water level of the lake, such as 1994 and 1995, the annual catch was only 2 959 tonnes and 2 656 tonnes, respectively. The lowest recorded catch was 1 600 tonnes in 1978, a year of serious drought. Even when stock enhancement measures were intensified, as in 1999, the annual catch was only 2 493 tonnes due to a long drought.

Every year from February to March, large quantities of waste water from industries drain into the lake through the estuary of the Yihe River and pollute the water of the lake, resulting in the death of fish and restricting the development of aquaculture and fishery resources enhancement at Lake Luoma. As a result of this pollution, the content of total inorganic nitrogen increased by 108 percent, from 0.684 mg/litre measured in 1976 to 1.423 mg/litre measured in 1998. The nitrogen load of the lake has become considerably higher than that of other lakes in China.

2.3 Unsustainable fishing effort and aquaculture practices

In 1976, there were 4 824 fishers and 817 fishing boats operating at Lake Luoma, of which only 11 had outboard motors. By 1995 the number of fishers had almost doubled to 9 361 fishers and the number of boats had almost tripled to 2 304, of which 1 370 were now equipped with outboard engines and had a combined horsepower of 13 430 HP. The resulting increase in fishing effort led to the overexploitation of the lake's fishery resources and fish stocks, and the average size and age of fish caught declined seriously for some commercial species. Although the high share (20.3 percent of the total composition of catch) of crucian carp in the total catch was maintained, fish under

one year of age accounted for more than 90 percent of the catch by the second half of the 1990s, while in 1976, 62 percent of the catch had consisted of three- to four-year old fish. The average annual catch of large-sized *Eryghroculter erythropterus* (Basilewsky) declined from 330 tonnes from 1986 to 1991 to eight tonnes from 1994 to 1999, reduced by more than 40 times.

Aquaculture began at Lake Luoma in 1986 with a total area of 38.7 ha and an annual output of about 70 tonnes. By 1999, the total area under aquaculture had been expanded to 3 233 ha with an annual yield of 7 156 tonnes. There were 762.13 ha under pen culture and 1 ha under cage culture. The prevailing form of aquaculture was pond culture along the lake, with silver carp and bighead carp as the main species, and wuchang fish, grass carp, common carp and crucian carp as the secondary species accounting for 70 to 80 percent of the annual yield of aquaculture at the lake. Although fisheries research institutes and fisheries technical extension stations provided technical assistance to fish farmers, most still applied extensive culture methods without feeding due to funds and technology constraints. More intensive culture methods, which would have been profitable for high value species, were not used.

3. CREDIT AND MICROFINANCE PROGRAMMES

Fishers and fish farmers at Lake Luoma benefited from similar credit and microfinance programmes to that of the fishers and fish farmers at Lake Taihu. From 2001 to 2003, 3.028 million yuan was disbursed to fishers and fish farmers at Lake Luoma. More than half of this amount was used for the construction and repair of fishing boats and about a quarter each for fishing gear and pen culture. Table 2 shows the loan amount disbursed to fishers and farmers at Lake Luoma from 2001 to 2003.

The operating expenses of fishing boats for which credit can be obtained include the cost of fuel, fish boxes and licence fees. In the case of pen culture, licence fees, the cost of fingerlings, feed and net cages are the main items covered by a loan.

4. ACTION PLAN FOR THE SUSTAINABLE DEVELOPMENT OF INLAND FISHERIES

With a view to rehabilitating the aquatic environment of Lake Luoma and to conserve and enhance its fishery resources, an action plan for the sustainable development of fishery resources is being implemented at the lake under the overall guidance and coordination of the FMC. The implementation of the action plan started in 2004 and will end in 2010. As part of the plan, a law for the protection for the regional fisheries environment at Lake Luoma is under preparation.

4.1 Protection and rehabilitation of ecology and the environment

Based on data collected in 1997 and 1998, phosphorus accounted for 91 percent (900 tonnes) of the nutrients flowing into Lake Luoma from rivers, and the nitrogen level increased to 1.423 mg/litre in 1998. This led to excessive eutrophication in the lake. The reduction and control of the inflow of fertile waters from farmlands through rivers and channels into Lake Luoma was chosen as the main approach to reduce eutrophication.

TABLE 2
Loans disbursed for inland fisheries and fish farming at Lake Luoma, 2001-2003, in yuan 10 000

Year	Construction, repair and operating expenses of fishing boats	%	Buying new nets and equipment	%	Pen culture	%	Total loan amount
2001	51.8	53	24.7	25	21.5	22	98
2002	49.1	50	25.2	26	23.4	24	97.7
2003	55.2	52	23.8	22	28.1	26	107.1
Subtotal	156.1	52	73.7	24	73	24	302.8

Source: Statistics from the Fisheries Management Committee of Lake Luoma, 2004.

Protection of aquatic plants and benthic animals

Suitable aquatic plants such as aquatic grass and benthic animals are not only food for some fish species, but also play the important role of consuming nutrients and purifying water. Their protection and rehabilitation has been ensured by introducing year-round conservation zones for fish and closed fishing seasons, and through their consideration in the regulation of fishing effort.

To protect benthic animals and organisms, the method of harvesting snails and other shellfish with suction machines was forbidden all year round. With the aim of rehabilitating clam stocks, 50 tonnes of river clams (*Corbicula fluminea* Müller) were stocked in the lake in 2004.

In recent years, the number of boats excavating sand had increased sharply because of the strong demand. The excessive excavation of sand from the lake bottom not only caused harm to aquaculture operations, but also had devastating effects on the ecology of Lake Luoma. The action plan introduced drastic measures to limit and strictly regulate the excavation of sand.

Closed seasons and conservation zones

Year-round fishing was one of the important factors that placed stress on the fishery resources of Lake Luoma. Since its inception, the FMC of Lake Luoma gradually expanded closed fishing seasons as well as conservation zones. Fishing is closed in the entire lake from 1 March to 1 June. To ensure that all fishers comply with this regulation, all fishing vessels and fishing gears are evacuated from the lake and berthed at pre-determined ports during the closed season in accordance with the Fisheries Law of China and the Fisheries Management Regulations of Jiangsu Province. There are plans to extend the closed season to four months.

Two year-round conservation zones were established on the southern and the northern part of Lake Luoma. The southern conservation zone has a water area of 670 ha and the northern conservation zone has a water area of 1 400 ha. Fishing is prohibited year round. The Baimiaohu zone with a water area of 670 ha has been established to protect ice fish breeding. The use of monofilament gillnets and trawl nets is generally not allowed but depends on the conditions of ice fish stocks.

Fishing licence regulations and fishing quotas

The FMC of Lake Luoma is aware that the present fishing effort is too high and aims to reduce and regulate this effort through a system of licences and quotas. Every fisher who operates on the lake must apply to the FMC for a fishing licence. The total number of licences issued in a given year should be in keeping with the available fishery resources, taking into consideration the livelihoods of the fishers. When limiting and reducing the number of licences, the FMC gives priority to full-time fishers who depend exclusively on fishing for their livelihoods.

According to the Fisheries Management Regulation of Jiangsu Province and the fishing quotas assigned by the Ocean and Fisheries Bureau of Jiangsu Province, the FMC restricts the main fishing gears that are allowed to operate on the lake. In 2004, 398 fishing "barricades" (down from 1 000 "barricades" in 1985) were allowed to operate, and 1 180 fisher households were allowed to operate small fishing gears such as gillnets, shrimp traps, and hooks and lines. The FMC also regulates fishing seasons for some fishing gear, mesh sizes, gear dimensions and locations where gear can be operated. In the case of fishing barricades, for example, regulations stipulate that like all other fishing gear, they cannot be operated during the closed season from 1 March to 1 May. Each barricade cannot have more than four nets and cannot be longer than 200 m. The mesh size of the cod end must be larger than 2 cm and the distance between two barricades must be greater than 50 m. The distance of fishing barricades from conservation zones must be at least 500 m. All harmful fishing gears and methods are

TABLE 3
Stocking at Lake Luoma, 2000–2003

Year	Total weight of fingerlings (in kg)	3-cm fingerlings	Fertilized eggs of ice fish (in 10 000)	Crabs (in 10,000)	Expenditure (in yuan 10 000)
2000		2 220		4.8	32.5
2001		1 125	1 030	2.0	27.9
2002		1 620	1 000	4.5	28.6
2003		1 650	850	110	31.2
Total	4 973	6 615	2 880	121.3	120.2

Source: Statistics from the Fisheries Management Committee of Lake Luoma, 2004.

banned from use in the lake, such as electro-fishing, explosives and cloth barrages for ice fish, drift nets with small mesh sizes, drum screens, pound nets and other harmful local fishing gear.

Stocking of fingerlings

Stocking of fingerlings is a particularly effective measure for enhancing fishery resources in the case of migratory and semi-migratory fish and crab species, which do not reproduce in the lake. Stocking of fingerlings of grass carp, silver carp, bighead carp and wuchang fish in Lake Luoma began as early as in 1967. Most of the stocked fingerlings had a body length of either 3 cm or 7-10 cm.

In 1976, a hatchery was established at Lake Luoma for stocking fingerlings in the lake's waters under the jurisdiction of Suqian County. More than two million fingerlings produced at the hatchery with a body length from 7-10 cm were stocked in the lake together with fingerlings of grass carp and wuchang fish with a body length of 3 cm, procured from Xinyi County. Hatchery-raised fish accounted for 6 percent of the total catch of 105 tonnes in 1976 and thus contributed to a higher fish production.

The stocking for fishery resources enhancement at Lake Luoma continues until today and the amount of fingerlings varies depending on availability of funds. From 2000 to 2003, 4 973 kg of fingerlings with 3 cm in body length, 28.8 million fertilized eggs of ice fishes and 12.1 million crabs were stocked in the lake and the total amount of funds spent on stocking was 1.202 million yuan in 2000-2003, as shown in Table 3.

Because of fund limitations and limited hatchery capacity, the amount of fingerlings stocked in Lake Luoma is considerably less than at Lake Taihu, at only 8 percent of the latter. Consequently, the share of hatchery-produced fish in the total catch is less than ten percent while it ranges from 15 to 20 percent at Lake Taihu.

To improve stocking programmes at Lake Luoma, both quantitatively and qualitatively, research must be conducted to improve stocking techniques regarding the species and sizes to be stocked, with due consideration to the characteristics and the state of the different stocks in the lake, and with the objective to maximize recapture rates of stocked species and economic benefits. There are plans to build a new hatchery and to improve the quality and quantity of fingerlings procured from other hatcheries. In the case of ice fish, resource enhancement will shift from stocking fertilized eggs to stocking larvae to improve the survival rate and the resource enhancement effects of the stocking programme.

Moderation of aquaculture development

Aquaculture at Lake Luoma was taken up enthusiastically by both fishers and farmers, and the area under aquaculture increased rapidly. As shown in Table 4, by 2003, 4 133 ha in and on the lake were used for aquaculture.

TABLE 4
Area and yield of aquaculture at Lake Luoma

Year	Area (in ha)	Yield (in tonnes)
1986	38.7	90
1990	359.3	1 169
1995	1 746.1	4 715
1999	3 233.1	7 156
2003	4 133.3	6 874

Source: Statistics from the Fisheries Management Committee of Lake Luoma, 2004.

Three types of aquaculture methods were used in different ecological environments of the lake – pond culture along the shores of the lake with low dykes, pen culture in areas with shallow water, and cage culture in areas with deeper water. Aquaculture development is seen as a way to reduce fishing pressure and thus protect the newly enhanced fishery resources and increase the income of fishers and farmers. There is also awareness that aquaculture can contribute to eutrophication at the lake through the feed used. Aquaculture development should therefore be moderate. The use of eco-friendly and organic aquaculture practices using organic feed and fertilizers, and substances to control diseases is therefore advocated by the FMC.

Eco-friendly pilot aquaculture practices supported by biological and technological scientific research are presently implemented on 45.7 ha for eco-friendly pond culture, 108 ha for eco-friendly pen culture, and 4 125 ha for eco-friendly cage culture. The objective is to diversify the structure of the aquaculture industry on the lake, focusing on growing high-value fishes and shrimps, thereby maximizing both the economic and ecological benefits. In the case of pen culture, there are plans to change the traditional pen culture in parts of the lake, reduce the area under culture, and increase the economic benefits by growing high-value species more efficiently and in a more eco-friendly way. Efforts are also under way to establish brand names for aquaculture products from Lake Luoma that would reflect eco-friendly production methods and command a higher price.

4.2 Promoting additional employment opportunities and capacity building

In 2003, the total yield of capture fisheries and aquaculture at Lake Luoma reached 10 000 tonnes. It is difficult to provide further employment for fishers or farmers in fisheries and aquaculture taking into account the limited possibilities for further increases of fish production. Governments at various levels and the fisheries department are therefore exploring opportunities to create new employment opportunities in the cultivation of aquatic plants, and in secondary and tertiary sectors of the economy in fields such as processing and marketing of aquatic products and value-addition.

At present, there is only a small frozen aquatic products processing plant at Lake Luoma with an annual production capacity of 800 tonnes. To support the processing and marketing of new value-added aquatic products, the government provides financial support for market research and product development. There are presently 142 boats that purchase fresh fish and 76 brokers for aquatic products operating at the lake. The government is trying to expand the team of brokers and improve the services they provide.

Lake Luoma offers good opportunities for cultivating aquatic plants and aquatic vegetables. In 1977, the cultivation of water chestnuts began in an area of 30 ha; the area was extended to 567.8 ha in 1998. In addition, 9 000 yuan/ha worth of lotus roots, gorgon fruits and wild rice were cultivated in 1998. The cultivation of aquatic plants and fruits is being further expanded.

With the aim of increasing the knowledge and skills of fishers and fish farmers on all aspects that concern their occupations, livelihoods and political participation, a short course will be offered twice a year for 50 to 70 participants at a time. It is planned to train a minimum of 500 fishers over the next seven years. The course topics will include: the rehabilitation and protection of fishery resources; ecologically-friendly aquaculture techniques and practices; fishing gear and fishing methods; processing of aquatic products; marketing of aquatic products; and fisheries policies and regulations.

5. FINANCING OF SUSTAINABLE DEVELOPMENT OF INLAND FISHERIES THROUGH FISHERY RESOURCES ENHANCEMENT FEES AND GOVERNMENT SUPPORT

Since the establishment of the FMC at Lake Luoma, the Fisheries Bureau of Jiangsu Province has provided funding support to the FMC on a regular basis for various

purposes related to the rehabilitation and management of inland fisheries at Lake Luoma. Funding support went to: the construction and maintenance of the buildings housing the FMC and equipment used by the committee; the construction of patrol boats for the inspection of fishing operations; the construction, maintenance and operation of hatcheries producing fingerlings for stocking purposes and for the purchase of additional fingerlings; the establishment of fish protection and conservation zones; and training and capacity building.

5.1 Scientific research funding

The Ministry of National Science and Technology, and the Science and Technology Bureau of Jiangsu Province support inland fisheries development and rehabilitation at Lake Luoma through research projects on aquaculture technologies and new species to be cultured. From 1995 to 2000, the Ministry of National Science and Technology provided 170 million yuan for a large-scale study on the opportunities of ecologically-friendly fisheries and aquaculture development at Lake Luoma. Ten researchers were involved and demonstrated to fishers and fish farmers various kinds of ecologically-friendly fish-rearing methods and technologies. At present, there are many ongoing research subjects on different aspects of sustainable development of inland fisheries at Lake Luoma, which receive technical and financial support from academic institutions and government agencies.

5.2 Fishery resources enhancement fees

As in the case of Lake Taihu, the FMC of Lake Luoma collects a fishery resources enhancement fee from fishers, fish farmers and also from fish traders. The fee is collected at the time of issuing fishing, fish farming and fish trading licences. In recent years, the annual fishery resources enhancement fees collected amounted to yuan 400 000, of which two-thirds were used to buy fingerlings for stocking and re-stocking.

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II. A success story of inland fisheries development and rehabilitation, and supporting credit and financing programmes at Lake Taihu, China

By XieYingliang and Yan Xiaomei

1. GEOGRAPHY, HYDROLOGY AND IMPORTANCE OF LAKE TAIHU

Lake Taihu, one of the five largest freshwater lakes in China, is located in the southern part of the Changjiang River Delta in China between latitude 30°55'40"N–31°32'58"N and longitude 119°52'32"E – 120°36'10"E. The lake covers an area of 2 427.8 km², which includes 48 islands. To the west and southwest of the lake are foothills; the eastern shores face the city of Shanghai. The total area of drainage of the lake is 36 500 km², occupying 0.4 percent of the total land area of China. The Lake Taihu drainage area belongs to three provinces, Jiangsu, Zhejiang and Anhui, and one city, Shanghai. Jiangsu Province covers 52.6 percent; Zhejiang Province, 32.8 percent; Shanghai, 14 percent; and Anhui Province, 0.6 percent of the drainage area of the lake.

In addition to Shanghai City, which falls directly under the jurisdiction of the Central Government, the drainage area includes four other cities in Jiangsu Province (Suzhou, Wuxi, Changzhou and Zhenjiang), three cities in Zhejiang Province (Hangzhou, Jiangxing and Huzhou), as well as 30 counties. Forty-nine percent of the population in the draining area of Lake Taihu live in cities. By 1997, the total population in the drainage area of Lake Taihu was 36.11 million, accounting for 2.9 percent of the total population of China. The drainage area of Lake Taihu is therefore one of the most densely populated regions of China.

As far as the utilization of land in the drainage area is concerned, 41 percent is used for agriculture, 16 percent consists of water bodies, 18 percent is occupied by settlements and buildings, and 25 percent for a variety of other purposes. In the Lake Taihu area, 50 000 people are involved in fisheries-related activities including 20 000 fishers and fish farmers.

The Lake Taihu drainage area has the shape of a dish with high elevations in the southwest, low elevations in the northeast, and both moderately high and low elevations in the centre. Of the total drainage area, 16 percent consists of foothills, 16 percent of rivers and lakes, and 68 percent of plains. The lake is not only located in the centre of a large drainage area, but is also the backbone of water conservation.

The main water source of Lake Taihu is the Zhaoxi water system of Tianmu Mountain in Zhejiang Province. The principal water flows enter into the lake from the Daqian and the Xiaomei River systems in the southwest and from 72 other small streams. Another important water source is the Jinqi water system of Mao Mountain on the boundary between Zhejiang Province and Anhui Province. The main water flows enter the lake through the Dapu River system in the west and its more than ten separate branches. The branches of the river are interconnected through creeks so that the water flow is adjusted automatically. The main water outlets of the lake are located along the

eastern shores of the lake, where the lake water feeds rivers such as the Liangxikou, the Shadeng, the Xukou, the Guajing and the Taipu River. Water flows out of the lake into Yangcheng Lake through the Beijing-Hangzhou Grand Canal and from there into the Changjiang River and the East China Sea through the Huangpu River, the Wusong River and the many creeks between Taichang City and Changshu City.

The holding capacity of Lake Taihu is 4.423 billion m^3 at a water level of 2.99 m and the average water depth of the lake is 1.89 m. The lake can hold around 8.3 billion m^3 at a water depth of 4.65 m. Because of the large surface area of the lake, an additional amount of 23 million m^3 of water needs to enter the lake to cause the water level to rise by 1 cm. For this reason, there is only a small change in the water level between rainy and dry seasons.

Because of the lake's water-holding capacity, the low-lying areas of the plain in which it is located are protected from floods. The lake also supplies water for irrigation for both areas with lower elevation and areas with higher elevation, such as the foothills to the west of the lake. In years with normal rainfall, the lake provides enough water for irrigation purposes: in years with little rainfall, water is pumped into the lake from Changjiang River. In addition to providing water for agriculture, Lake Taihu also plays an important role in supplying water to cities and towns in the drainage area. Many cities located on the lake, such as Wuxi and Suzhou, draw water directly from the lake. As a source of water for the Huangpu River, it is an important indirect source of drinking water for Shanghai.

Lake Taihu and its drainage area also play an important role in navigation. There are 900 main and branch shipping lines, with a total length of 12 000 km. Over the years, the shipping network has expanded in all directions connecting rivers and lakes to the East China Sea.

2. CONSTRAINTS TO INLAND FISHERIES DEVELOPMENT

Fisheries at Lake Taihu have been and are being constrained by a number of factors. The construction of eight major dams and sluice gates along the rivers and lakes in the Lake Taihu drainage area in the 1950s and 1960s, particularly along the Changjiang River, led to a sharp decline of stocks of migratory species entering Lake Taihu through migration between rivers and the sea, and of species that cover shorter intra-river longitudinal distances between rivers and lakes.

In order to increase the production of rice in the 1960s and 1970s, many shallow water areas covered with grass along the lake were enclosed and separated from the lake for rice cultivation. This resulted in a decline of fish and shrimp stocks that had used these areas as spawning and nursery grounds.

Illegal fishing gear and fishing methods brought about a relative decline of large- and middle-sized fish stocks and a relative increase of young and small-sized fish populations. The deterioration of the lake's environment resulted in the growth and bloom of algae during the summer periods in the middle of the 1980s and 1990s, which resulted in the deterioration of water quality, the death of fish and a sharp decline of fish stocks.

The influx of wastewater from rice fields and fishponds around the lake and from sewage systems is a cause of eutrophication and a serious constraint for the sustainable development of the inland fisheries.

At present, trawling is the main fishing method at Lake Taihu targeting mainly estuarine tapertail anchovy (*Coilia ectenes*), ice fish *(Salangidae)*, silver carp and bighead carp.

3. EFFORTS AND ACHIEVEMENTS IN REHABILITATING FISHERIES AND THE AQUATIC ENVIRONMENT

Lake Taihu is suitable for the growth and reproduction of finfish. The capture fishery at Lake Taihu targets mainly finfish, which accounts for 85 to 95 percent of the total

catch, followed by shrimp and shellfish. As many as 106 species of fish have been recorded historically. Most of them are resident species, migratory species between river and sea, and semi-migratory species in rivers.

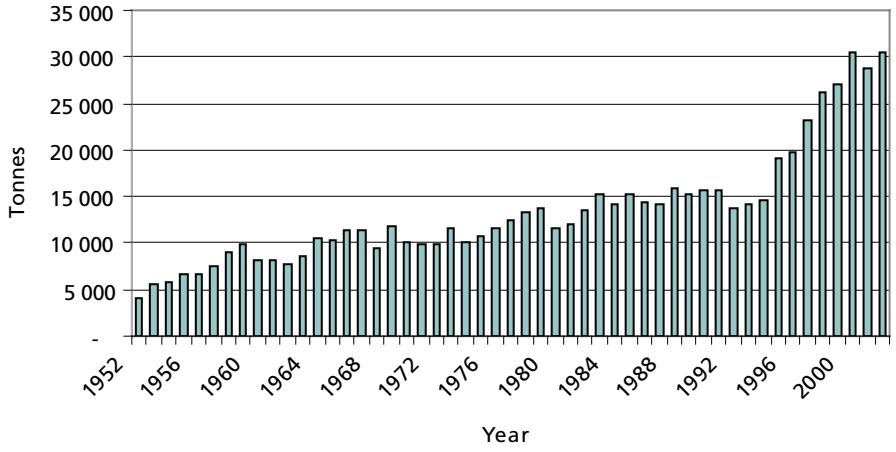
By the end of the 20th century, the number of fish species found in Lake Taihu had declined to about 65 species as a result of the impact of human activities and changes of the natural environment. These activities and changes included the construction of dams and sluice gates, inflow of water polluted by farming and industrial activities as well as fishing operations. Tapertail anchovies, ice fishes and newly introduced silver carp and bighead carp became the dominant species in the lake.

With the purpose of preventing a further deterioration of the water quality of Lake Taihu and its drainage area, the protection of the aquatic and natural environment in and around the lake was placed under the control of national projects. Since then, the Governments of Jiangsu and Zhejiang Provinces and Shanghai City have made joint efforts to fight water pollution in Lake Taihu, which are now showing first positive results. From the late 1990s on, strict regulations were introduced and enforced on the discharge of water and waste by towns, enterprises, industries and fish ponds; the prevention of oil spills from fishing and other vessels; and on other sources of pollution of the waters of Lake Taihu.

The establishment of the FMC of Lake Taihu in 1964 under the leadership of the Government of Jiangsu Province with the participation of the Government of Zhejiang Province introduced the policy of "paying equal attention to enhancement and aquaculture, exploitation and protection, production and management". The FMC liaises with four cities, seven counties and leaders of fisher associations at the village and town level. As a result of the efforts of the committee pursued over more than 40 years, and through protection of fish reproduction and releasing of hatchery-raised fish fry into the waters of the lake, the annual catch has increased steadily, as shown in Figure 1. The annual catch at Lake Taihu was 30 516.5 tonnes in 2002 and the estimated annual catch for 2003, not included in Figure 4, was 35 000 tonnes, valued at 380 million yuan.

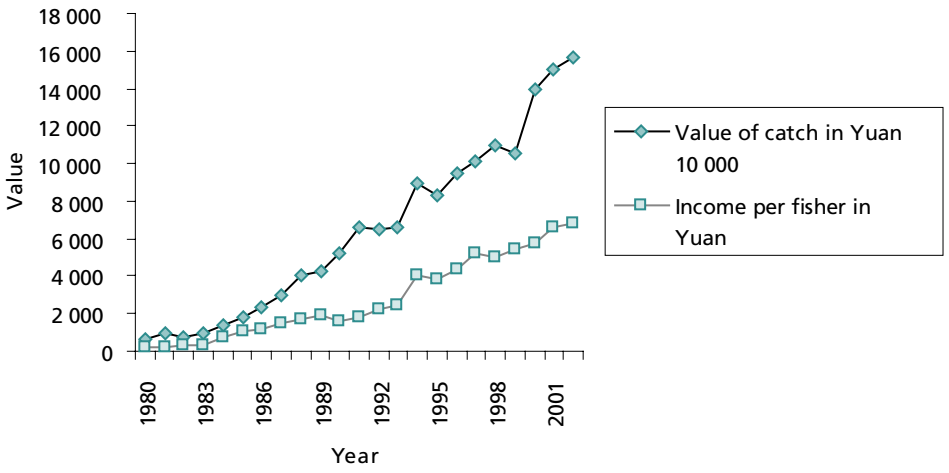
The stocking of the lake's waters was introduced in the late 1960s; by 1998 as many as 239 million different kinds of fingerlings and 863 million "summer fingerlings" (10 cm in body length) had been released into Lake Taihu. In conjunction with the stocking of the lake's waters with hatchery-raised fingerlings, seasonal protection for spawning populations was introduced in the late 1960s. By the middle of the 1980s, the FMC of Lake Taihu had enforced a closed fishing season for six months of every

FIGURE 1
Catch at Lake Taihu, 1952–2002



Source: Statistics from the Fisheries Management Committee of Lake Taihu, 2003.

FIGURE 2
Value of catch and fish income in Lake Taihu, 1980–2002



Source: Statistics of Fisheries Management Committee of Lake Taihu, 2002.

year for the entire lake. The protection zone for spawning fish populations was further extended by the middle of the 1990s. All these measures promoted the sustainable development of fisheries in the lake.

As a result of these measures, each year the value of the catch and average income per fisher increased, as shown in Figure 2. In 2002, the total value of catch at Lake Taihu was 156.5546 million yuan, and the average income per fisher was 6813 yuan, which is higher than the average income of a farmer.

The measures taken to overcome the constraints to fisheries development at Lake Taihu are described below.

3.1 Stocking of lake waters

With the aim of mitigating the effects of dams and sluice gates that obstruct fish migration, the FMC of Lake Taihu began to stock migratory and semi-migratory species that cannot breed in Lake Taihu, such as fingerlings of silver carp, bighead carp, black carp, grass carp, wuchang fish, common carp and crucian carp. In addition to the 239 million fingerlings and 863 million "summer fingerlings" that had been stocked into Lake Taihu by 1998, 2 522 kg of Japanese eel fry were released into the lake from the late 1970s to the early 1980s. From the middle of the 1960s to the early 1990s, 41 600 kg of larvae of Chinese mitten crabs were stocked, and 13 100 kg one-year-old crabs were released from 1988 to 1993.

In 2003, the FMC continued its artificial stocking efforts. Common fingerlings were released during the winter season when their chances of survival were highest. The FMC also fine-tuned their stocking programmes to make them more efficient both in terms of biological and economic results. Larger quantities of fingerlings of high-value species were released. In addition to releasing common fingerlings during the winter period, a method of combining the stocking of fertilized eggs, summer fingerlings and large-size fingerlings was applied.

The annual amount of funds spent on stocking fingerlings in 2003 was 2.853 million yuan. This included funds for stocking 5.4819 million "spring fingerlings" with a total weight of 187 000 kg, 58.9788 million "summer fingerlings" of common carp with a total weight of 37 907.24 kg, 45 994 million fertilized eggs of ice fish, 41 336 juveniles of soft-shelled turtles, 70 947 eel fry, 120 600 *Erythroculter ilishaeformis* (Bleeker) fry and 276 640 seeds of *Hemibarbus maculatus* (Bleeker).

The stocking has played a significant role in the continued and steady increase of fish production at the lake and fishers' income: the total catch had reached 35 000 tonnes in 2003 valued at 380 million yuan; and the average annual income of fishers had increased to 6 813 yuan by 2003.

3.2 Establishment of seasonal conservation zones and closed seasons

The enclosure of shallow, grassy lake areas and their separation from the lake for farming purposes resulted in a loss of water area of 13 400 ha and in a loss of spawning and nursery grounds of fish, shrimp and other aquatic organisms. To mitigate these negative effects, a seasonal conservation zone with a water area of 800 ha and an abundance of aquatic plants was established in the eastern part of Lake Taihu for the breeding of common carp and crucian carp. This zone was extended to 12 000 ha in 1978, and the conservation season was extended by one month. A perennial conservation zone with a water area of 3 400 ha was established in 1981 between the eastern and western mountains bordering the lake, and an additional conservation zone for spawning was established in 1985 in the Lanthanum area of the lake.

Because of a decline of ice fish stocks, a closed season for fishing ice fish during the spring was enforced during the last four years. A conservation zone for ice fish with a water area of 6 667 ha was established east of the Taihu Bridge in 2003. Ice fish stocks are now managed and monitored on a daily basis all year round so that management measures can be adjusted to changing circumstances. The protection of spawning grounds of fish has been expanded to include more species and to cover longer periods and larger water areas.

For the purpose of protection and rehabilitation of fishery resources, the FMC of Lake Taihu declares closed fishing seasons. During 2003, the closed season was extended from a previous three to seven months. During the closed season, some of the licensed fishing operations are allowed to continue, however.

3.3 Fishing gear regulations and bans

Killing fish with poison, explosives and electric current is illegal. In 1972, small-mesh purse seines with cod ends and crab digging were banned. This was followed later on with bans on other fishing gears that catch or harm juvenile fish, such as shrimp nets, trawling with several vessels, barrier nets, shrimp baskets, nets covering sluice gates and bottom cages. The use of fishing barricades was limited from late September to February, because they kill and wound stocked fingerlings and juvenile fish due to their small mesh size.

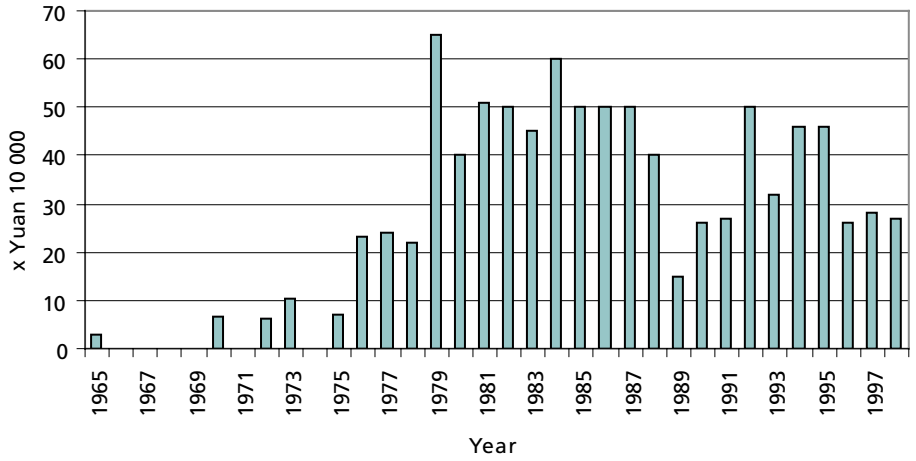
The FMC of Lake Taihu introduced and strictly enforces zones for the use of floating and fixed nets with a view to reducing conflicts between operators of the two types of gear and to increase catch of target species.

The FMC also strictly enforces a system of fishing and fish farming licences. In 2003, FMC issued 5 564 licences for fishing and 1 700 licences for aquaculture; in turn, fishing without a licence has been greatly reduced in the lake.

3.4 Integrating fishing with fish farming, fish marketing and processing

Traditionally, fishers on Lake Taihu were subsistence fishers. In the late 1970s, fishers began to construct fishponds and to culture fish in natural ponds. By the late 1980s, 90 percent of the 59 fishing villages along the lake were farming fish with a combined annual yield of more than 4 000 metric tonnes. In addition, they were engaged in processing and exporting aquatic products. Fishing vessels were used for transportation during the period of closed fishing seasons and many fishers set up small enterprises in villages and towns. The contribution of income from fishing to the total income of a fisher's household declined in many cases to as little as ten percent.

FIGURE 3
Government expenditure for stocking at Lake Taihu, 1965–1998



Source: Statistics of the Fisheries Management Committee of Lake Taihu, 1999.

Recently, a new form of aquaculture, pen culture, has been taken up in suitable areas of Lake Taihu. In 1997, the total value of pen culture production at Lake Taihu reached yuan 120 million, exceeding the value of capture fishery production, which was 100 million yuan in the same year.

3.5 Source and use of funds for fishery resources enhancement

The funds, which are used for the stocking programmes and protection of fish in the lake, come principally from two sources: government agencies and, increasingly, the fishers themselves operating at Lake Taihu by collecting a fee for fishery resources enhancement. This reflects the underlying principle of fisheries management at Lake Taihu, that whatever is taken from the lake should be used in its interest, and that fishery resources enhancement should eventually fund itself through resource use fees, rather than through regular government budget expenditure.

Government contribution

From 1965 to 1998, a total amount of 20.1688 million yuan was spent on the stocking of Lake Taihu, of which yuan 9.265 million was contributed by the government. This was the largest amount spent on the stocking of any lake in China. Figure 3 shows the annual expenditure.

Collection of fees for the enhancement of fishery resources

The FMC of Lake Taihu began to impose a fee for fishery resources enhancement at Lake Taihu in 1965 and 40 000 yuan was collected in the same year. In 1996, a system of fishing licences and new regulations on imposing fees for fishery resources enhancement were introduced. By 1998, a total amount of 12.1135 million yuan had been collected, which covered 95.5 percent of all expenditure incurred in the stocking of the lake's waters with fingerlings (Table 1).

From 1970 to 1982, the fee for fishery resources enhancement was calculated as a share of the sales value of fish caught in the lake. The fee was collected when fishers sold their catch to consignees along the lake. In the case of full-time fishers residing at the lake, 2.5 percent of the sales value of the catch was retained as fishery resources enhancement fees. With regard to part-time fishers and external fishers, 5 percent of the sales value was collected as the fee. In 1982, the FMC of Lake Taihu changed the calculation of the fishery resources enhancement fee: it was no longer calculated as

TABLE 1
Revenue and expenditure for fishery resources enhancement at Lake Taihu, 1973–1998, in yuan 10 000

Year	Revenue	Expenditure	Revenue as share of expenditure (%)	Year	Revenue	Expenditure	Revenue as share of expenditure (%)
1973	6.78	9.36	72.44	1986	87.60	105.38	83.13
1974	4.55	5.92	76.86	1987	112.88	137.86	81.88
1975	7.97	30.26	26.33	1988	145.62	152.61	95.42
1976	7.60	16.15	47.06	1989	202.40	245.47	82.45
1977	6.18	23.82	25.94	1990	219.74	278.32	78.95
1978	8.48	28.94	29.30	1991	295.65	338.24	87.41
1979	11.54	31.16	37.03	1992	320.00	350.33	91.34
1980	9.50	27.59	34.43	1993	357.71	423.23	84.52
1981	13.52	58.20	23.68	1994	364.81	495.42	73.64
1982	25.86	45.95	56.28	1995	341.33	397.70	85.83
1983	30.10	56.01	53.65	1996	322.54	453.99	71.05
1984	37.20	75.12	49.52	1997	352.28	526.62	66.89
1985	52.70	94.47	54.06	1998	1 211.35	1 268.30	95.51

Source: Statistics from the Fisheries Management Committee of Lake Taihu, 1999.

a share of the sales value of the catch and collected at the time of selling it, but was calculated according to the tonnage of the fishing vessel operated at the lake and the size of fishing gear used and collected at the time of issuing the fishing licence. This change was much appreciated by fishers as the fee was now uniform for a given size of vessel and its gear, and no longer increased with the value of catch. The change also motivated fishers to participate more actively in the fisheries management of the lake. The combination of issuing and registering fishing licences and collecting fishery resources enhancement fees was embedded in a new fisheries regulation issued in 1986 as part of the "supporting the lake with the lake" policy.

During 34 years, from 1965 to 1998, a total of 53.7523 million yuan was collected as fishery resources use fees. From 1965 to 1974, the average fees collected per year were only 46 000 yuan. This annual revenue more than tripled, increasing to 158 000 yuan from 1975 to 1984; it then increased more than tenfold to 1.9937 million yuan from 1985 to 1993; finally it more than doubled to 5.1846 million yuan from 1994 to 1998.

In the 1990s, following the development of pen culture in Lake Taihu, a regulation on the leasing of water areas for pen culture and other fishery uses was introduced. The lease fees are calculated as a percentage of the annual sales value of the pen culture production and range from 3-5 percent or 6-10 percent, depending on the status of the fish farmer/fishers, i.e. full-time, part-time, local or external, etc.

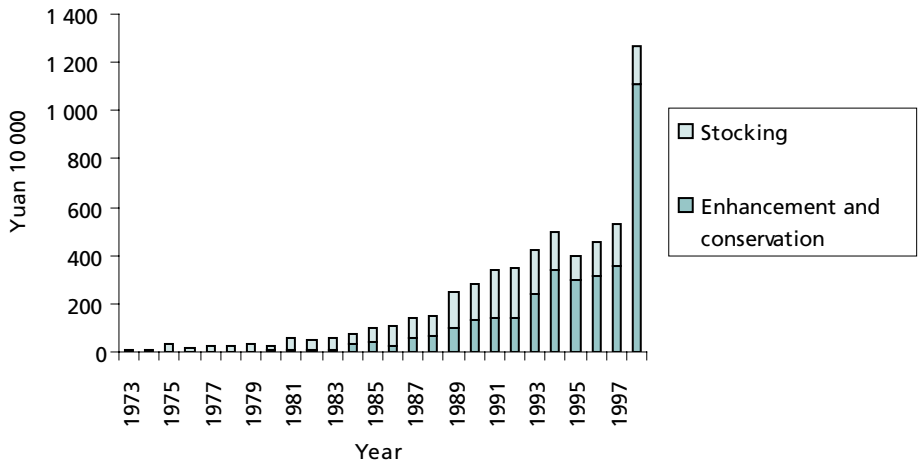
While fees for fishery resources enhancement were initially exclusively used to finance the stocking of fingerlings in the lake, these fees were later used increasingly to fund the expansion of protection zones for spawning fish. Figure 4 shows the use of fishery resources enhancement fees separately for stocking and for protection of spawning fish, referred to as "multiplication and protection" from 1973 to 1998. In the late 1990s, expenditure for fish protection was higher than expenditure for stocking of fingerlings.

Regarding the question whether the fishery resources enhancement fees were sufficient to meet the expenditure incurred in enhancing and protecting the fishery resources, it is interesting to note that by 1998 the major portion of the expenditure, i.e. 95.51 percent, had indeed been covered by the fees and that the policy objective of fisheries management at Lake Taihu "supporting the lake with the lake" had largely been achieved.

3.6 Technical assistance from the Ministry of National Science and Technology

Lake Taihu has been studied by many scientific research institutes, universities and colleges. From 1950 to 1970, ten surveys were conducted on the fishery ecology and

FIGURE 4
Use of fees for fishery resource enhancement of Lake Taihu, 1973–1998



Source: Statistics of the Fisheries Management Committee of Lake Taihu, 1999.

biology of the lake and on the fishing gear used. In the late 1970s, the National Science Committee set up a scientific and experimental framework for fishery resources enhancement at the lake. Within this framework, more than ten research institutes at the national, provincial and city level, and universities and colleges in Shanghai, Nanjing and Suzhou supported and cooperated with the FMC of Lake Taihu. Scientific research concentrated on the enhancement and protection of fishery resources and the sustainable development of fish production. Research has played an important role in guiding fisheries management at the lake and further research is planned on environmental rehabilitation through the use of aquatic plants and animals such as fish, shrimp, shellfish, algae and aquatic plants. Funds for the research are provided by the Ministry of Science and Technology.

4. CREDIT AND MICROFINANCE IN SUPPORT OF INLAND FISHERIES

In 1999 and 2000, the Bank of China issued provisional regulations for rural credit cooperatives on the provision of credit and microfinance to agriculturists and farmers, including fish farmers and fishers, as well as guidelines for the management of these loans. These regulations and guidelines played an important role in providing much-needed credit and microfinance support to inland fisheries management and rehabilitation at Lake Taihu. In accordance with regulations and guidelines, fishers and fish farmers can obtain credit and microfinance from rural credit cooperatives operating in the lake region without providing traditional collateral.

4.1 Loan purpose, eligibility and credit-worthiness

Loans are provided for capital investment and working capital requirements of capture fisheries and fish farming. To be eligible for receiving a loan, a borrower must: be a self-employed fisher or fish farmer with a regular income; have a properly registered residence in a county or town on Lake Taihu; and have sufficient labour available in his or her family to carry out the fishing or fish farming activity for which credit is sought in accordance with existing fisheries, environmental and other regulations. The borrower must also have the capacity to manage and repay the loan.

In the place of traditional collateral such as an adequately valued piece of property, which many small-scale fishers and fish farmers do not have, the credit-worthiness of a potential borrower is assessed. The assessment is carried out by a group formed by

the rural credit cooperative, which consists of the director of the cooperative council, the director of the credit department of the cooperative, a loan officer, members of the cooperative's supervisory council and a fisher/fish farmer representative with an outstanding business and financial reputation. The assessment includes a review of the income of the borrower and his or her family over the last two years, as well as an assessment of their production-related credit needs.

The assessment of credit-worthiness produces a credit rating of the potential borrower. Three grades of credit-worthiness are distinguished – an excellent, good and common credit rating. An excellent credit rating implies that the borrower has a proven loan repayment record over at least three years with a full and timely repayment of both principal and interest of loans taken during that period. Other requirements for an excellent credit-worthiness rating are an annual minimum net family income of 2 000 yuan and the capacity to provide an equity contribution to a loan of 50 percent from own finances. A good credit rating requires the repayment of past loans and a net annual family income of at least 1 000 yuan. A common credit rating requires a net annual family income of at least 500 yuan and available labour in the family to carry out the activity for which the loan is requested.

4.2 Loan disbursement, monitoring and repayment

Once the assessment of the credit-worthiness has been completed, a credit card is issued, which indicates the annual amount of credit available. Only one card is issued per family or household and the card is not transferable. In case of an excellent credit rating, the borrower can take loans of up to a maximum of 20 000 yuan per year. Throughout the period for which the credit card is valid, the borrower can take several loans without applying again separately for each of them. The borrower can withdraw the loan amount by simply showing his credit card together with an identity card or household card. This practice is very convenient as it prevents delays of loan disbursements due to delays in the processing of individual loan applications.

After a loan has been taken, the credit officer of the rural credit cooperative visits the fisher or fish farmer regularly to supervise the use of the loan. In case of natural calamities, failures of fishing seasons, fish diseases and other causes of genuine default in the repayment of loans, loan repayment can be rescheduled.

In the case of microcredit, the loan is to be repaid within a year. In the case of larger loans, loan repayment periods extend beyond one year. The interest rates charged to borrowers follow the benchmarks established by the Bank of China. These include preferential rates of interest in the case of microcredit for fishers, fish farmers and other small rural entrepreneurs.

From 2001 to 2003, the rural credit cooperative of Jiangsu Province alone provided 9.57 yuan million of credit and microfinance to fishers and farmers at Lake Taihu (see Table 2). In order to promote the development of pen culture, the FMC of Lake Taihu introduced a special programme under which interest rates of loans are subsidized by provincial governments and through other sources of funds. From 1988 to 1993,

TABLE 2
Loans for inland fisheries at Lake Taihu, 2001-2003; in yuan 10 000

Year	Loans for construction and repair of fishing boats	%	Loans for acquisition of fishing gear	%	Loans for pen culture of fish	%	Total
2001	250	66	56	15	70	19	376
2002	220	70	54	17	40	13	314
2003	180	68	57	21	30	11	267
Subtotal	650	68	167	17	140	15	957

Source: Statistics from the Fisheries Management Committee of Lake Taihu, 2004.

450 700 yuan was made available for this purpose by provincial governments as well as 947 900 yuan from other sources.

The credit and microfinance support to fishers and fish farmers at Lake Taihu has helped them finance their production inputs, acquire fishing gear that complies with fisheries regulations, and to shift from capture fisheries to fish farming, thereby reducing the pressure on capture fishery resources. It has further motivated fishers and fish farmers to more actively participate in fisheries management at the lake and to comply with management measures and regulations.

III. Management challenges for riverine fisheries and fishers in India

By P.V. Dehadrai

1. INTRODUCTION

Following the post-independence thrust on overall development in India, the riverine environment has been subjected to tremendous pressures. Human interference in the form of water abstraction, draining of rivers, dam construction, sedimentation and pollution has produced disturbing effects. A reappraisal of fisheries of certain stretches of rivers such as the Ganga (Kanpur to Bhagalpur) has indicated that the yield of major carps and several other commercial species has fallen during the period 1958-1961 to 1980-1986. The impact of man-made barriers on migrating fish species such as *Hilsa ilisha* is also evident from their decline in the upstream waters of River Ganga due to the Farakka Barrage. The example of River Ganga largely illustrates the situation existing in almost all Indian river systems.

Disruption of the environment and creation of man-made lakes on rivers, i.e. reservoirs, have displaced fisherfolk and adversely affected their livelihoods. The solution lies in raising fish productivity of rivers and streams since productivity in any commodity sector will determine employment and income level. The basic objective in riverine fisheries should be to give emphasis to improving water quality and conserving the biological, particularly fishery, resources, while attempting to optimize productivity (Dehadrai, 2002). Yield models need to be developed for multi-species and multi-gear fisheries, particularly in the wake of modified water abstraction and pollution from industry and agricultural fields. Since water has multiple uses, particularly irrigation and abstraction of water for domestic and industrial uses, there is a need for reconciling intersectoral conflicts. The requirements of drinking water, irrigation and fisheries should be treated holistically.

Ecological investigations covering several rivers during the past decades have helped understand the riverine environment and fish catch structure from the viewpoint of fishermen. Recently, due to the overall environmental degradation and man-made interferences in the catchment areas of river basins, there has been a perceptible decline in both fish productivity and production. It is therefore necessary to give added emphasis to fish biology *vis-à-vis* the changed environmental conditions towards eco-restoration and developing management norms in order to provide advice to government development departments.

The restoration of riverine fisheries entails a broad integrated approach, taking into account the requirements of fisheries and of other uses of land and water in the river basin. It also requires regulation of fishing effort, strict enforcement of closed seasons, rejuvenation of endangered fish species through stocking programmes, protection of natural breeding grounds and the setting up of sanctuaries for restoring depleted fish germplasm.

By virtue of their production potential, floodplain lakes constitute the frontline area in a river system where a judicious combination of culture and capture fisheries should be practised. Being a continuum of the river, floodplain lakes also have a vital

bearing on the health of the riverine fisheries ecosystem and therefore need adequate conservation measures in addition to harvesting the fishery resources.

Inland waters vary significantly in the nature and magnitude of their resources. Accordingly, these waters are managed differently for fishery activities under various property and management regimes. This mechanism has a direct bearing on the socio-economic conditions of the ultimate end users, the fishers (Sinha, 2002).

2. THE RIVERS

Traditionally, rivers have been managed as a common property resource. These resources have multiple uses for the riparian area population. The residents of the riparian area cannot be excluded from its use because they have the same rights and duties as in common property regimes.

The crux, however, lies with the commercial users or the individuals who depend on rivers for their livelihood, for instance, members of fishing communities, agriculturists using water for irrigation, the sand excavation industry, and shipping and water transport services. Property regimes must clarify the perceptions of the collective use of scarce and valuable resources or those worth protecting. It would restrict all users to exploit the resource within tolerable limits in order to avoid any encroachment on the interests of other users with the same or different purposes. Riverine fish stock, a scarce and valuable natural resource, has been declining over the past few decades due to human intervention, which acts against the fishers' interests through water abstraction, dam construction, draining of rivers and sedimentation, etc.

In India, rivers are state property and various river stretches within or between states belong to departments of fisheries, revenue, forestry, village *panchayats* and other government agencies and authorities. These departments and authorities apply different policies for fishing in river stretches under their control. With rivers being fluvial and fish being migratory renewable resources, it is difficult to apportion fish biomass to territorial limits. From the fisheries' viewpoint, most of the rivers are in open access areas, with some exceptions where they are leased to cooperatives or private parties.

The fishery requisites such as fishing gear and craft for river stretches with open access, and those leased by cooperatives are either owned or shared by fishermen. In the case of river stretches leased to private parties, usually fish traders and contractors, fishing gear and craft belong to fishers or may be financed or provided by these contractors. Table 1 shows that the remuneration for catch and distribution of profits to fishers are highest in open access regimes. Fishing is remunerated according to contribution in terms of fishing effort and fishery requisites. Fishers contributing boats and nets receive a higher share than those sharing these requisites with their owners.

In the case of river stretches leased by contractors and cooperatives, the remuneration and payments largely depend on the pattern of catch disposal and the method adopted for payments under the respective regime. The contractor, usually a fish trader himself, does not share his profits with the fishers. In the case of cooperatives, the remuneration of fishers is a percentage of the market price of fish caught after deducting the commission of the cooperative society for rendering its service. The profits are later distributed among the members of the cooperative society according to their share capital.

Table 1 also shows that the working efficiency and extent of remuneration are presently highest under a cooperative management regime and open access, and lowest under a private property regime. This finding suggests that privatization of fishing rights in riverine fisheries in India would accelerate the process of social disequilibrium and broaden income inequalities. It would push the downtrodden further down and the already economically well-off fish traders further up the social and economic ladder.

TABLE 1
Input-output profile of riverine fisheries under different management regimes

Item	System		
	Open access	Leased by private parties	Leased by cooperatives
A. Input profile			
Percentage of fishers with type of gears			
Gillnet	67.06	56.27	57.14
Dragnet	18.14	32.23	17.14
Castnet	7.78	5.02	2.86
Hook and line	24.37	21.73	34.20
Others	6.59	5.62	20.00
Percentage of fishers with own boat	79.64	62.13	25.00
Annual fishing effort (workdays/year)	281.82	293.24	147.63
B. Output			
Catch per household (kg/year)	1 431.67	780.02	376.46
Catch per day (kg)	5.08	2.66	2.55
C. Costs and benefits			
Costs			
Fixed cost per year (INR)	2 907.31	3 017.17	1 451.48
Variable cost per year (INR)	1 712.21	1 737.39	285.43
Total cost per year (INR)	4 619.52	4 754.56	1 736.91
Benefits			
Price received (INR per kg)	24.09	18.79	34.82
Gross return per year (INR)	34 488.93	14 656.58	13 108.34
Net returns per year (INR)	29 869.41	9 902.02	11 371.43
Net returns (INR per kg)	20.86	12.69	30.21
Input-output ratio	7.49	2.90	7.55

Source: Sinha and Katiha, 2002.

2.1 Inter-state river management conflicts and their effect on fisheries development

In India's federal policy there are in-built strains between the Union Government and the states, which are independent and coordinating authorities and not subordinated to the former. Entry 14 of List II of Article 246 of the Indian Constitution places agricultural research and education on the State List, whereas regulation and development of inter-state rivers and river valleys are covered under Entry 56 of List I, which is the Union List.

The recent history of India is replete with inter-state river disputes. As the ownership and rights of the management of rivers are vested in multiple agencies, it becomes difficult to have a coordinated approach. Whereas Article 262 provides a mechanism for resolving disputes or complaints with regard to the use of waters of inter-state rivers and river valleys, no such mechanism exists for the regulation of fisheries of such rivers on a uniform basis. In the case of River Ganga, which flows through four states, Uttaranchal, Uttar Pradesh, Bihar and West Bengal, the exploitation policies are at variance, depending on the importance of riverine fisheries in each state. There is a definite need for carrying out stock assessment studies and associated aspects, namely, patterns of breeding and recruitment. Furthermore, the impact of man-made changes and disturbances in the catchment areas of the river basin needs to be linked to fish productivity and production. Therefore, the creation of a controlling agency, namely, an inter-state riverine fisheries board, should be considered for the formulation of a rational and ecologically sound exploitation policy for the fisheries of inter-state rivers. Once this is agreed on in principle, the modalities can be worked out by a committee of experts. This authority may be along the lines of the National Highway Authority as in the case of surface transport.

2.2 Constitutional position and proposals for legislative reform

Entry 21 of List II of Article 246(3) of the Indian Constitution puts fisheries in the State List, whereas regulation and development of inter-state river and river valleys figure in Entry 56 of List I, i.e. the Union List. Under Section 3 of the Indian Fisheries Act, which came into force in 1897, the states promulgate rules and regulatory measures that generally comprise limiting access to fishery resources, licensing fishing gear, gear restrictions and leasing, and auctioning of fishing grounds.

The operation of various fishery laws in the country, however, has not yielded the desired results. Although declarations and intentions are ambitious, little has been achieved at the implementation stage. The time is now ripe to revisit the fishery laws and other associated rules for the development of inland fisheries. The following proposals for legislative reforms merit attention:

- To deal with the conflicts in regard to the management of river basins and of the inter-state fishery resources, the inclusion of the fisheries management of the inter-state rivers could be considered in the Concurrent list of the central and the state governments.
- The anachronistic Indian Fisheries Act of 1897 should be repealed and a new comprehensive act should be formulated after taking stock of all the changes in the last five decades.
- Keeping in view the diverse local conditions, the central law may be of limited use, but related rules should be promulgated within the basic framework of a comprehensive Central Act.
- Inland fisheries should be included in the Concurrent list of the Indian Constitution so that the Union Government can also frame laws.
- Although deterrence is not the sole basis of law, the punishment prescribed in fishery laws is very mild. Even in the matters of food adulteration and drugs, it becomes difficult to bring offenders to court. Unfortunately, in fisheries, violation of the rules is not taken very seriously.
- An expert group comprising environmentalists, fishery scientists and jurists should examine the possibility of making offences relating to destruction of habitat environment and aquatic life cognizable and non-bailable.
- The enforcement machinery needs strengthening although it may lead to an increase in the financial liability of development departments. Without adequate manpower and social ethics, it is difficult to implement even ideally conceived laws. The duty of conservationists, planners and decision-makers does not end by adding a new law to the statute book unless it is administered properly.
- The river-cleaning programme should be closely linked to afforestation of the river basins and the overall catchment areas. Further, man-made interferences may push us near to the point of no return if we do not oppose them with an iron will.

In view of the above, the following may be considered for promulgation and implementation (Dehadrai, 2002):

- A reliable database on a time series mode should be generated while planning the formulation of development strategies for open water fisheries, especially the riverine fisheries in the country.
- Special programmes should be implemented in identified areas to raise awareness on the conservation of biodiversity, initiate revival of commercially viable biomass and protect the habitat.
- Open water fisheries and riverine fisheries cut across the geographical boundaries of various states. Conservation and sustainable exploitation measures taken in one state need to be complemented by the neighbouring states up- or downstream of the rivers following globally agreed principles of responsible fisheries. Mechanisms for inter-state understanding and coordination would need to be developed.

- Indiscriminate fishing from secluded pools of water created along the banks of the rivers after floods recede has been a major cause of depletion of commercially important fish stocks in rivers. These breeder pools may be protected by declaring them fish breeding parks and sanctuaries.
- Certain identified strategic but manageable high-altitude streams and lakes may be adopted under a biodiversity conservation programme through a ban on fishing, protection of habitat through punitive orders, and enhancement of natural populations with ranching certain species such as Mahseer and snow trout through hatchery breeding.

The existing rules and regulations under the Indian Fisheries Act (1897) have provision to control and monitor the use of gear and mesh size, as well as the observance of closed seasons.

For effective implementation of the regulations, the following measures may be considered:

- While leasing riverine stretches to lessees, conditions should be clearly stipulated with punitive clauses on violations of conditions.
- Mesh size regulations may be monitored by inspecting landing centres for fish size in particular seasons and parties operating along certain river stretches made responsible.
- Riverine stretches to be leased may be enlarged in length to minimize fishing pressure per unit length of the river by the lessee.
- Lease period should have a flexible component with the possibility to extend the period depending on the performance of the lessee.

2.3 Socio-economic status of fishers of River Ganga

Studies have been conducted to ascertain the factors responsible for declining fish production, but investigations on changes of the social, economic, cultural and occupational status of fishers are lacking.

A study conducted by Tyagi in Uttar Pradesh and Bihar along the Hardoi-Bhagalpur stretch of River Ganga shows that inland fishers are in the grip of severe poverty. In both states, 73.29 percent of inland fishers fall below the poverty line and 27.55 percent are classified as very poor.

3. INLAND OPEN WATER FISHERIES

Around 2.4 million out of the total 3.2 million tonnes of inland fish production in 2002/2003 came from inland aquaculture. Of the remaining 0.8 million tonnes, the contribution of reservoirs was around 0.6 million tonnes and the remaining 0.2 million tonnes were contributed by the open water fisheries of rivers and floodplain lakes.

The development of riverine fisheries is at a critical point. In the case of the Indian rivers, floodplain lakes and wetlands, degradation and loss of habitat are rapidly increasing. With respect to the environmental status of the rivers, the enhancement of fish yield appears to be a distant possibility. The multiple uses of these resources make the implementation of ameliorative measures difficult. Evidently, conserving the germplasm in an open water regime is more purposeful than efforts to increase yield, because biodiversity could at least be preserved, particularly the fish fauna. If such measures could be implemented, there could be an overall improvement in the habitat, and fish production from rivers and floodplain lakes could reach up to around three million tonnes.

At present, the fishery resources are “exploited” by entrepreneurs and contractors and “utilized” by fishers and fish farmers. There is need to conduct a study on the impact of development efforts on the techno- and socio-economic status of fishers to generate benchmark data, which could serve as a base for the future development strategies in the open water fishery sector. A well-formulated project could help

establish credit and microfinance systems for inland fishers and their families, train fishers, create ancillary vocations, construct roads, and develop infrastructure including health, school education, nutrition and sanitation, etc. Preparatory research would be essential, such as:

- studies on credit needs and traditional credit sources of fishers;
- identification of best approaches to poverty alleviation among inland fishers in close cooperation with fishers, executive members of fisheries cooperatives, heads of SHGs, bankers, fishery administrators, etc;
- evaluation of costs and earnings of various inland fishing craft and gear, and analysis of their technical and financial viability;
- credit and microfinance programmes design and document formulation for the management of these programmes;
- workshops to impart training to all concerned with the management of these programmes.

4. MICROFINANCING MODEL

As fishers are scattered and poor in the riverine fisheries sector, the microfinance approach would be the most suitable approach, as indicated in Figure 1 by Upare's modified model, SHGs/cooperatives – bank linkage with NGOs as financial intermediaries (2004).

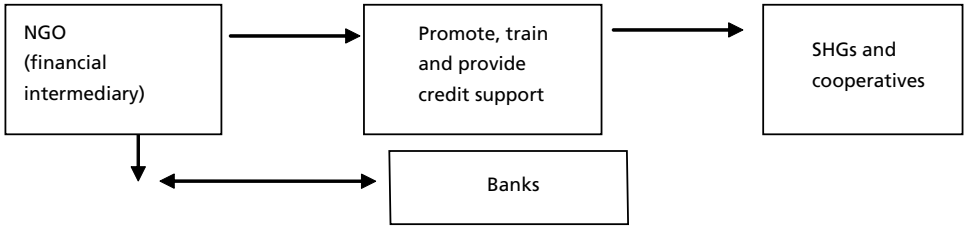
NGOs have emerged as key players and are the most common institutional type of microfinancing institutions. In the light of governments being inefficient as microfinance providers, NGOs could venture into financing not only groups, but also individuals, particularly women, in support of their income-generating activities and trades.

The growing awareness of the importance of women as economic providers and their pivotal role in sustaining the family increases the need to include them in new development programmes and to facilitate their participation in ongoing programmes. It has been observed that income earned by women is more likely to be spent on food and other basic needs of the family than income earned by men. Consequently, it is recognized that an increase in women's income is more likely to improve family status than increased household income *per se*.

The Department for International Development (DFID)-funded programme in West Bengal and Orissa is an exemplary case showing success in SHG-formation for rural aquaculture and fisheries (Tripathi and Dutta, 2004). Facilitated by community organizations, the project used group formation as its entry point. This helped build social capital in clusters of villages, whereas "financial capital" was built up through group savings, in which microfinancing could also contribute.

In this and other efforts to alleviate poverty among inland fisherfolk, improving their livelihoods and rehabilitating and developing inland fisheries, the "natural

FIGURE 1
Modified model of SHGs/cooperatives – bank linkage with NGOs as financial intermediaries



capital" is already available with the potential fish catch from the rivers, the scope for cage and pen culture, and the tapping of other resources from open water fisheries. But the "physical capital" in the form of nets, boats, baskets, ice, landing centres, transport and communication, etc. would need to be provided. Similarly, the human capital consisting of technical knowledge of fishing, fish processing, marketing and other fishery-related skills would have to be developed.

In addition to fishing operations, the following ancillary enterprises should be promoted among inland fishers for income generation, particularly during non-fishing seasons, and for supporting microfinance facilities needing to be extended:

- fish net making and repair;
- sale of fishing gear through cooperatives, SHGs or NGOs;
- spawn collection from flooded rivers during monsoons;
- cage culture of fish in suitable river stretches;
- pen culture of fish in suitable areas of river banks;
- fish product development (pickles, chips, noodles, munches, etc.);
- marketing of fish products;
- sport fishing and ecotourism;
- dried fish trade;
- aquaculture in ponds;
- ornamental fish breeding and marketing;
- bamboo cultivation with supporting nurseries bamboo handicrafts.

The involvement of women needs to be encouraged in all the above vocations.

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IV. Credit and microfinance programmes in inland capture fisheries in West Bengal and Assam, India

By M.A. Upare

1. INTRODUCTION

After China, India has the second largest inland capture fishery production in the world. Fisheries play a very important role in the Indian economy as they provide employment opportunities and are an important source of protein for their population. It is also an important source of foreign exchange earnings. The fisheries sector contributes 1.21 percent to the total GDP and 5.37 percent to the GDP of the agriculture sector. The sector generated export earnings from marine products of US$1 425 million in 2002-2003 and provided employment for 5.9 million full-time and part-time fishers, and for a similar number of people in ancillary and supporting activities. The present fish production is estimated at six million tonnes compared to an assessed potential of 8.4 million tonnes. Opportunities are thus available for further development of the sector and the consequent strengthening of the rural economy, employment generation, reduction of poverty and generation of additional export earnings. The States of Assam and West Bengal are important inland fisheries states in the country, not only from the point of view of their potential for the development of fish farming, but also because fish is the main constituent of the local diet and about 95 percent of the states' populations consume freshwater fish.

2. PRESENT STATUS OF INLAND CAPTURE FISHERIES IN INDIA

India has vast inland fishery resources in rivers and canals (171 334 million km), reservoirs (3.1 million ha), tanks and ponds (2.2 million ha), estuaries, floodplain lakes (0.24 million ha) and wetlands, offering tremendous scope for fish production. However, irrational forms of exploitation can endanger the delicate balance of a fragile inland fishery ecosystem. Open water resources are managed on the basis of exploitation of natural stocks. Therefore, sound environmental protection norms should be established and followed to develop inland fishery resources exploitation in a sustainable manner.

The river system of India comprises 14 major rivers, 44 medium rivers and innumerable small rivers and desert streams. A variety of river systems provides one of the richest fish genetic resources in the world. The Indian floodplain lakes are primarily a continuum of the rivers Ganga and Brahmaputra. Floodplain lakes usually take the form of oxbow lakes locally called *mauns, chaurs, jheels* and *beels*, especially in the States of Assam, Manipur, West Bengal, Bihar and Eastern Uttar Pradesh. Reservoirs constitute the single largest inland fishery resource both in terms of resource size and production potential. A study conducted by FAO in 1995 estimated a total of 19 370 reservoirs in India with a total area of 3.15 million ha (Table 1). The study also classified the reservoirs into small, medium and large as follows:

TABLE 1
Number and size of reservoirs in India

	Small	Medium	Large	Total
Number	19 134	180	56	19 370
Area (ha)	1 485 557	527 541	1 140 268	3 153 366

Source: Report of the Working Group on Fisheries for the Tenth Five Year Plan (2002-2007), Government of India, Planning Commission, June 2001.

2.1 Rivers and floodplains

The extensive network of Indian rivers (45 000 km) and canals (126 334 km) constitute one of the major inland fishery resources of India. Rivers also serve as primary habitat for the original germplasm of Indian fishes. The present-day riverine fishery yield is low, with an average yield of 0.3 tonne per km, which is only 15 percent of the estimated potential. Riverine fisheries are considered fisheries that generate yields below subsistence level. Catch statistics over many years indicate a declining trend for riverine catches, both in quantitative and qualitative terms. The average yield of major carps in River Ganga declined from 26.62 to 2.55 kg/ha/year during the last four decades. Biologically and economically desirable fish species have started to be replaced by low-value species as their populations are rapidly declining. Recent studies have shown that environmental changes, such as the decline of water level and volume due to sedimentation and water abstraction accompanied by river course modifications and irrational fishing practices, are the key factors responsible for the decline of riverine fish production.

Most Indian floodplain lakes are located in the States of Assam, West Bengal, Bihar and Uttar Pradesh. They occupy an important position in inland fisheries of India because of their magnitude and production potential, and because they serve as breeding and nursing ground for riverine fish stocks. These water bodies are extremely rich in nutrients. Unfortunately, the floodplain lakes in India have not been cared for and many are in the process of becoming swamps. Floodplain lakes are capable of yielding on average one tonne of fish per ha if subjected to scientific management. Therefore, a vast untapped production potential is yet to be harnessed in floodplain wetlands.

While much emphasis has been placed at various national and international scientific fora on the conservation of fish germplasm and diversity, particularly through the adoption of effective conservation measures for riverine and floodplain fisheries, such measures have yet to be incorporated into fisheries development plans and fisheries regulations in India. Floodplain fisheries schemes received attention, however, in the IX Development Plan of the Central Government of India and were initiated in 1995-1996 for the floodplain fisheries in UP and Bihar through a World Bank-assisted project.

2.2 Estuaries

India's estuarine systems (2.7 million ha) have been identified as important sources of fish and prawn seed, which are vital for both riverine and marine fisheries. The fisheries in estuaries in India are considered to produce yields above subsistence level, with average annual yields between 45 and 75 kg per ha. The commissioning of the Farakka Barrage, for example, has resulted in changes of the salinity and species composition of the Hooghly Matlah estuary. The increased water volume had a positive impact on the fishery of this estuary. The proposed impoundments in the Narmada River will completely change the ecology and the fisheries of the estuary in years to come. With some exceptions, the changing physical and economic environment is expected to offer an immense potential for fishery enhancements. In coastal areas, unfortunately, no specific measures have been taken yet for the development of estuarine fisheries.

2.3 Reservoirs

After independence, many small, medium and large river valley projects were implemented in India, which created a chain of impoundments in the form of reservoirs. Covering a total area of 3.15 million ha, reservoirs are today the most important inland open water fishery resource; in another two decades, they are expected to cover six million ha. The present fish production from reservoirs is estimated at 94 000 tonnes: 79 percent is contributed by small reservoirs, followed by large (14 percent) and medium ones (seven percent). Because of the lack of proper management, the present average annual yield of 20 kg per ha is far below the potential. While much higher yields can be achieved, even a moderate increase to 100 kg/ha for small reservoirs and to 50 kg/ha for medium and large reservoirs can provide an additional increment of 165 000 tonnes of fish valued at INR495 000 million at INR 30/kg. For this reason, reservoirs hold the largest potential for future fisheries development in India.

2.4 Upland fishery resources

Indian upland aquatic resources include rivers (8 253 km), natural lakes (21 900 ha) and reservoirs (29 700 ha). The capture fishery of these waters is poorly developed; it is characterized by low primary productivity of resources, slow growth rate of fish, inefficient fishing practices and inaccessibility of fishing and landing sites. Information on fishery resources and fish catches lacks proper documentation due to the diffused nature of the resources and the small quantity of catch per fisher. The information gathered in the recent past indicates an alarming downward trend in the quantity and average size of indigenous snow trout, mahseer and other fishes. Upland fisheries are less developed than other fisheries, primarily because of the low income derived from this enterprise. Upland fishers are often part-time fishers using traditional craft and gear.

3. ASSAM

3.1 Present status of fisheries and future potential

Fish is an important constituent of the diet of 95 percent of the state's 25 million population. The present annual fish production from all resources is about 160 000 tonnes against a demand of 300 000 tonnes, leaving a gap of 140 000 tonnes between supply and demand. The per capita availability of fish has been reported as 6.77 kg per year against a nutritional requirement of 11 kg per year. The gap between supply and demand is partially met by importing fish from other states such as Andhra Pradesh, Uttar Pradesh, West Bengal and Bihar. Fisheries play an important role in the Assam State's economy in addition to providing livelihoods for rural people, directly or indirectly.

Assam State has two major river systems, several beels, lakes, tanks/ponds and swamps, and is endowed with valuable fishery resources. Fishery resources and production of the state are shown in Table 2, together with the estimated level of exploitation.

TABLE 2
Fishery resources and production of Assam State

Fishery resources	Area	Annual production	Exploited area/level of exploitation
Riverine fisheries (4 820 km)	205 000 ha	50 kg/km	Negligible
Beels and oxbow lakes	100 000 ha	180 kg/ha	30 400 ha
Reservoir fisheries	1 713 ha	Negligible	Negligible
Ponds and tanks	25 423 ha	1.2 tonnes/ha	2 390 ha and 35% in terms of average productivity
Low lying areas and swamps	26 421 ha	not available	Negligible
Fish seed hatcheries	61		
Forest fisheries	5 017 ha		
Derelict water bodies	10 000 ha		
Total	347 153 ha		

Source: Department of Fisheries, Government of Assam.

As can be seen from Table 2, less than ten percent of ponds and tanks, and less than one-third of beels and oxbow lakes are used for fishery purposes. Riverine and reservoir fisheries are negligible.

Tanks and ponds

Although almost ten percent of the tanks and ponds in Assam are being utilized for fish culture, productivity levels are very low. It is estimated that the average annual productivity is approximately 1 200 kg per ha, while it is 4 000 kg/ha in other Indian states. There is scope for increasing the productivity to levels between 3 000 and 4 000 kg/ha/year by adopting scientific management measures and proper fisheries extension work.

Beel and wetland fisheries

Beels are considered one of the most productive inland water systems owing to their characteristic interactions between land and water. The flow of organic matter from the catchment area brings large amounts of nutrients, which increase the productivity of the beels. The present level of fishery production from beels is very low (14 to 488 kg/ha), with an average of 180 kg/ha. It is estimated that only one-fifth of the fishery potential is being realized from these waters. The utilization of the full potential of beel fishery would add up to 82 000 tonnes of fish per year to the total fish production of Assam. The annual net economic gain would total approximately INR3 280 million assuming a price of INR40 per kg of fish.

Wetlands perform many important environmental functions. They maintain the stability of lowland ecosystems, retain floodwater and recharge ground water. They also provide water for drinking and irrigation, serve as habitat for aquatic organisms and migratory birds, and conserve biodiversity. Floodplains are vital breeding and nursery grounds for numerous fish species populating rivers and other open waters.

There are many stakeholders associated directly and indirectly with beels, including fishers, leaseholders, state governments, NGOs and others. Each of them operates at a different level. At the ecosystem level, the state government is associated with beels through drafting and implementing resource use policies for the production and conservation of aquatic resources and environment. At the resource level, leaseholders and managers are responsible for managing the fishery resource; at the exploitation level, individual fishers or groups of fishers exploit and manage the resource. There are various management domains with different components and outputs. The multiple uses of aquatic resources such as beels and wetlands for various purposes generate conflicts between different stakeholders, users and uses. Therefore, the objective of management should be to facilitate trade-offs between the different interests involved in the use of aquatic and fishery resources of beels and wetlands.

Generally, wetlands are managed for various broad objectives such as economic benefits, biodiversity conservation, protection of habitat, and maintenance of the ecosystem. Most important among them seems to be the economic objective. Profitability and higher economic return are the prime motives for beel managers in Assam. Many people are directly dependent on beels for various livelihoods. Food and livelihood security are other important objectives of beel management. As these resources are state-owned or commodity-owned, equity considerations also influence management. Overall sustainability is the fundamental objective of beel resource management.

Among other things, regular dredging and deepening of connecting channels to respond to siltation, clearing of weeds, changes in lease policies and proper technology transfer are essential for developing beel fisheries. Development programmes for beel fisheries involve the proper zoning of water bodies so that central areas can be used exclusively for capture fisheries and marginal areas for aquaculture in ponds, pens and cages. It is suggested that 20 percent of the available beel area, i.e. 20 000 ha, may be

brought under the fold of aquaculture over the next ten years. This is expected to yield a productivity of 4 000 kg per ha per year. Capture fisheries in the remaining beel area can be developed to yield 500 kg per ha per year by employing 15 000 fishing craft and gear units.

Reservoir and riverine fisheries

It is estimated that fisheries can be developed in 1 713 ha of existing reservoirs in Assam by suitably stocking them after assessing their production potential. The reservoirs are expected to yield a production of 150 kg/ha/year over the next ten years by employing about 100 fishing units.

The scope for the development of riverine fisheries in the state depends on the implementation of both short-term measures, such as a ban on capture of fingerlings, and the establishment of closed seasons and conservation areas for brood stock protection, and on long-term management measures, such as a systematic survey of riverine stretches to obtain accurate information on various parameters of the present status of fisheries and on optimizing and modernizing fishing gears and crafts. Conservation measures coupled with optimum fishing efforts can lead to better exploitation levels. If these measures are taken, the average yield over the next ten years is expected to increase to 500 kg per km of river by employing 12 000 fishing units.

3.2 Property and use rights

Property and use rights regulate the allocation and access to fishery resources. These rights vary considerably throughout the state, from the highly controlled and exclusive private aquatic properties to the open access beels. Various factors such as the size of a beel, traditional and customary rights, physiographic dimensions, physical accessibility and connectivity to the rivers are the determining variables for the nature of property and use rights.

Over the years, a transition in property regimes in beel fisheries can be observed from open access fishing and control by groups of fishers towards exclusive use rights of leaseholders. This shift is mainly due to two reasons. First, the marketing potential of fish is increasing as the demand – and consequently the price of fish – are increasing. The second reason is the scarcity of fishery resources. The transition has benefited the state government, which is earning a higher amount of lease fees, although at the cost of reduced social equity, since many poor fishers are being excluded from the use of fishery resources.

In Assam as elsewhere, fishing rights are considered non-exclusive for other uses of waters, such as navigation, irrigation and human consumption, among others. While destructive fishing practices such as catching juveniles, using small mesh sizes, poison and explosives are not allowed according to the regulations, the enforcement of the regulations is generally weak. The power to take punitive action is vested with deputy commissioners and subdivisional officers.

Open access

Beels with a larger expanse of water, i.e. 300 to 1 000 ha, and a length from 2 to 10 km are under open access regimes. The exclusion of fishers from exploiting these waters is difficult in practice and involves considerable costs. In Assam, there are many unclaimed and disputed water bodies used by fishers as open access resources. Similarly, the impounded waters beyond the demarcated margins of a beel are open to everyone for fishing.

In most of the beels, customary rights of tribal people and other indigenous ethnic groups are legally safeguarded. These customary fishing rights are species-, gear- and purpose-specific. The use of small fishing gear such as scoop nets, dip nets, hooks and lines, and other small gear is allowed throughout the year for subsistence fishing of

naturally occurring fishery resources. Marginal areas of beels, where women fishers usually fish, are also recognized as open access areas after the main harvesting season.

In the case of subsistence fishers fishing in water bodies leased by a private party or group, the leaseholder charges a nominal amount of rent from small-scale fishers. These fishing rents vary from INR10 to 20 per day for fishing with small nets such as scoopnets and dipnets, depending on the particular fishing season but not on the catch of the subsistence fisher.

Ownership and control

More than 67 percent of the beels in Assam are owned by the government, which are the most productive ones. They are owned by three state departments, the Assam Fisheries Development Corporation (AFDC), the Revenue Department and the Forest Department. The beels under AFDC are used for fishery purposes. AFDC leases 192 beels for a period of five years to cooperatives or individuals. A small number of beels are also leased out by the Revenue Department. Beels under ownership of the Forest Department are not utilized for fisheries since they are located in national parks and reserve forests.

Non-government agencies such as community bodies, autonomous tribal bodies, village councils (*panchayats*) and schools, etc. control about 33 percent of the beels. These beels are leased out to individuals or groups of individuals. These agencies follow their own procedures of leasing out beels under their control. The lease amount or the rent is generally used for social causes, such as the maintenance and running of schools, construction and maintenance of roads, and donations to religious institutions. The proceeds are occasionally used for providing assistance to the poor within the community and for social functions such as marriages and funerals.

Leasing policy

According to the leasing policy of the state government, fisheries cooperatives are preferred for leasing out beels owned by government. The percentage of beels that can be leased out to cooperative societies is not to exceed 60 percent, however. Cooperatives are given the chance to win a lease bid at a lower rate than a private party. In the absence of a cooperative bidding for a lease, members of the fishing community or backward classes have priority. A concession of 7.5- 10 percent is given to an individual leaseholder belonging to a fishing community or backward class. At present, the amount of lease fees is about 20 to 30 percent of the revenue generated by fishing.

The lease period varies from three to five years, which is considered too short because it encourages the leaseholder to overfish broodstock and thereby deplete the beel's fishery resources. Longer lease periods would encourage more sustainable and responsible harvesting and management.

Conditions of fishing in leased or owned waters

The conditions for fishing in a beel that has been leased or is owned by a private party or community vary widely across the state. In community-owned beels, only fishers belonging to the same community are allowed to fish. In most other cases, groups of fishers having had previous contracts or arrangements are preferred over others. In some places, fishing groups from outside the state are preferred because they are considered more efficient and less demanding in negotiations. In a few localities, such as Majoli Island, the fisher groups have to pay INR5 000 to 10 000 as entry fees, in addition to the share of their catch that accrues to the owner or leaseholder of the water. The share of fishers varies between 30 and 70 percent, depending on the availability of fish, ease of catch, type of catch, prevailing practices, provision of craft and gear, provision of food and utensils, membership in fishing groups, and other factors. When fish is abundant, a

larger share goes to the leaseholder. When the leaseholder has to provide fishing boats and nets, her/his share increases by 20 percent.

Within the group of fishers, the leader (locally called a *hawaldar*) takes 60 percent of the catch when he does provide food, utensils, boats, nets and other essential fishing requisites; the remaining 50 percent is distributed among the fishers. In the case that the fishing equipment is collectively owned or hired, the revenue from fishing is equally distributed among the group members after deducting all costs.

3.3 Institutional and regulatory framework

The formal sector

The Department of Fisheries, the Assam Fisheries Development Corporation (AFDC) and the apex cooperative Fish Marketing and Processing Federation Limited (FISHFED) are the major formal institutions associated with fisheries development in Assam.

There are approximately 200 registered fishermen cooperative societies in Assam, of which only seven are presently operating. The cooperatives were originally organized under the Cooperative Department of the State of Assam. FISHFED was established to support the marketing of fish through providing necessary infrastructure, and to promote exports and value-addition. But as most of the cooperatives, however, FISHFED is barely functional and is only involved in the marketing of fish on a limited scale. Therefore, cooperatives and their apex cooperative FISHFED presently do not play a significant role in fisheries development in Assam.

The informal sector

The informal sector consists of NGOs, informal groups, social institutions, village communities, SHGs and others who are involved in fisheries activities. These institutions emerged with the need for a collective effort. They are mostly based on social relationships and perform other functions in addition to fisheries. They are efficient in terms of mutual reciprocity, information flow and accountability within the system. Informal organizations are also very flexible and therefore highly efficient in their operations.

In Assam, the family is the most important informal institution in the fisheries sector. The work and responsibilities of fishers and their work groups are distributed and divided within the family and kin-group according to their capabilities and skills. Women are involved in net making, selling fish, and preparing and supplying food to men at landing sites, drying and preserving fish, and similar activities, as well as occasionally catching fish in open waters.

Different types of groups can be distinguished concerning their role in inland fisheries. There are fishing groups, management groups and caste groups. Large-scale fishing is a group activity, particularly in large water bodies, which requires bigger nets and group-based fishing practices. For this purpose, permanent and semi-permanent fishing groups operate in Assam, which generally consist of 10 to 14 members belonging to the same caste. They either own or hire fishing craft and gear collectively. The value of the collective assets of many groups varies from INR50 000 to 200 000. The groups are locally known as *hawal*. The senior-most member with the best knowledge and experience in fishing is made group leader, locally known as the *hawaldar*. The leader acts as a representative of the group in negotiations with leaseholders and owners of water bodies. Each member of the group is entitled to an equal share after the fixed and variable expenses have been deducted including the cost of food during fishing. Occasional absences from fishing due to illnesses or family emergencies are tolerated and minor medical expenses in the case of accidents are paid from the collective income of the group.

In addition to fishing groups, there are management groups. Membership varies from two to four members. Management groups perform functions such as taking and managing a fishing lease, investing in fishing craft and gear, and selling catch. The

individual responsibilities vary from place to place. The shares of the group members are based on their relative contribution to the management tasks.

Caste groups are important means of social reciprocity and sharing information. They are also important for collective bargaining, especially for ensuring free access rights, percentage sharing and negotiating the terms of entry into fishing grounds controlled, owned or leased by others. Caste groups also interact with each other. There are various caste groups belonging to different communities, such as Hindu fisher groups, Maimal community fisher groups, Bangladeshi fisher groups, Bihari fisher groups and Muslim fisher groups.

3.4 Supply and support systems

External inputs are essential components for the scientific management of beels, the most crucial among them being seed. To purchase the appropriate size and quality of seed at the time of stocking is costly. The seed cost/ha varies between INR3 000 and 4 000. Quality seed is usually not available in adequate quantity at the time of stocking. Therefore, the government needs to take appropriate policy measures for fish seed production. In addition, the managers of beels need to invest in clearing weeds, constructing fish screens and providing fishing crafts and gears. The credit supply from financial institutions for these purposes is insufficient.

Another weak link in the development of beel fisheries in Assam is the lack or low degree of technological innovation and slow transfer of technology. Because the diversity of fishery resources needs specific technological interventions for different inland fisheries, the interaction of inland fisheries managers with fishery research institutions is a pre-requisite for the scientific management of inland fisheries. At present, only the Department of Fisheries and AFDC are involved in the technology transfer process. Their extension workers are not adequately trained and there is limited geographical coverage of fisheries extension services.

The infrastructure for value-addition and export of fishery products, such as road and transport infrastructure, ice plants and cold storages, hatcheries and other facilities, and the necessary public and private investments need to be promoted by the concerned government agencies. Another important area of attention is the marketing structure for fishery products and pertinent regulations. The share of middlemen in the retail price of fish in Assam is presently as high as 50 to 60 percent. Regulations on prices, margins and marketing channels and practices should be introduced in order to ensure that fishers get a fair and remunerative share. Measures such as the organization of market functionaries, promotion of horizontal cooperation in the marketing chain of fish, supply of market information, and development of public fish markets will improve the links of producers and local markets with domestic urban markets and export markets.

3.5 Credit and microfinance

Over the years, fishery credit schemes in India have been supported with refinance assistance from the National Bank for Agriculture and Rural Development (NABARD) with a cumulative disbursement of INR54.8 million. The trends in the disbursement of refinance for fishery credit schemes in Assam are shown in Table 3.

TABLE 3
Trends in the disbursement of refinance for fishery credit schemes in Assam, 1999–2004

Year	Amount (INR million)
1999-2000	1.024
2000-2001	0.351
2001-2002	0.269
2002-2003	-
2003-2004	2.000

Source: NABARD Annual Reports.

Refinancing fishery credit schemes in Assam focused on the provision of credit for fish farming and the purchase of nets and boats. Generally, the flow of institutional credit for fisheries in Assam has been poor due to a lack of awareness of the need and

TABLE 4
Progress of SHG-Bank linkage programme, 1998–2003, in INR million

Year	No. of SHGs bank-linked	No. of SHGs refinance-linked	Bank loan	NABARD refinance
1998-1999	14	1	0.207	.015
1999-2000	53	49	0.465	0.406
2000-2001	209	156	3.343	1.896
2001-2002	748	528	9.666	6.427
2002-2003	2 453	1 225	31.849	20.002

Source: NABARD Microfinance Report

usefulness of investments in inland fisheries development and rehabilitation, and due to a widespread absence of entrepreneurship both in fishery industry and management and in financial institutions.

Because non-institutional credit in Assam is very costly and not easily available for the inland fishery sector and other sectors of the rural economy, the institutional credit supply systems need to be improved for developing inland fisheries. With reference to rural credit, particularly to microfinance services, the linkage of sources of institutional credit with informal fishing groups would help to develop inland fisheries and fishers simultaneously, and lead to a greater flow of investment. The main hurdle for institutional credit in the past has been the requirement of collateral in terms of landed property. To increase the flow of credit, this requirement needs to be changed and other types of collateral, such as lease deeds of water bodies, should be accepted by banks as collateral instead.

The rural poor's access to microfinance services is being promoted through the SHG-Bank linkage programme. Under this programme, the formation of SHGs among the rural poor is encouraged and facilitated by banks, NGOs and government agencies. The groups and their members receive training and assistance in identifying their needs and opportunities for improving their livelihoods in simple business management, organizational skills, and vocational training, which in some cases enables them to take up new income-generating activities or to improve their traditional activities.

The groups are also encouraged to generate savings and use them for lending funds to their members for productive and other purposes. Once SHGs have shown that they are able to handle small savings and lending programmes using their own resources, they are then linked to banks and receive loans from these banks, where they also deposit their savings. The SHGs are then "bank-linked". After initially using their own funds, the banks involved can obtain refinance from NABARD for their lending to SHGs. SHGs, whose loans are refinanced by NABARD, are then "refinance-linked".

Unlike in other parts of India, the SHG-Bank linkage programme of microfinance has generally not progressed well in the State of Assam. The main reason is a lack of awareness and exposure among the various stakeholders. However, there has been visible progress of the programme from 2000-2201 onwards, as shown in Table 4. SHGs and their members are usually engaged in a variety of income-generating activities, of which fishing may be but one. In general, it is estimated that 20 percent of the SHGs in Assam are also involved in fishery-related activities.

Most of the SHGs can be found in Morigaon District and many have taken up fish farming, fishing and fishery-related activities such as fish drying, marketing of dried fish and net making.

There are 188 NGOs working in different districts of Assam with the major concentration in Kamrup District for the improvement of livelihoods of rural communities. To date, only a few of these NGOs are involved in the SHG-Bank linkage programme.

3.6 Constraints

There are various constraints to inland fisheries development and financing in Assam, particularly lack of coordination and extension support, and of the flow of credit and microfinance.

Technology, fisheries, extension support and coordination

- Lack of suitable fishing craft and gear for riverine fishing;
- Lack of suitably trained fisheries extension staff;
- Lack of coordination between various government agencies and organizations, such as the State Fisheries Department, the Assam Fisheries Development Corporation, the Assam Fish Farmer's Development Agency and the Assam Fisheries Cooperative Federation;
- Low productivity of carp culture ponds and tanks due to lack of fish farming extension support and training;
- Lack of fishing and fish farming technology in hilly and mountainous parts of Assam;
- Lack of fish culture technology for swamps and flooded forest;
- Neglect of beel fisheries due to their management by the Revenue Department;
- Lack of skills for the management and exploitation of ornamental fish resources in mountain streams.

Flow of institutional credit

- Perception of fish farming as high risk by financial institutions due to the inadequate supply of required quantities of quality fingerlings during the stocking season and due to the regular occurrence of floods;
- Lack of insurance cover for fishing and fish farming;
- Lack of legally valid title deeds and other land documents, especially in the case of lands acquired by way of inheritance;
- Poor loan recovery performance of past fisheries lending.

Flow of microfinance

- Lack of awareness and exposure to microfinance programmes, and lack of a clear understanding of the government's and NABARD's rural self-employment programme – *Swarnajayanti Gram Swayamrojgar Yojana* (SGSY), and of understanding the concept of the SHG–Bank linkage programme among bankers and government officials;
- Communication gaps between rural bank branches and the controlling offices;
- Unclear legal status and collateral requirements of SHGs;
- Lack of experience of NGOs in the promotion of SHGs;
- Difficult law and order situations in some parts of Assam;
- Difficulties in establishing a credit rating of SHGs.

3.7 Opportunities and scope for the development of sustainable inland capture fisheries

Once the above constraints have been properly addressed, there are ample opportunities for the sustainable development of inland fisheries in Assam.

Beel fisheries

There are 430 registered beels and 766 unregistered beels accounting for approximately 60 and 40 percent of the water area of beels, respectively. Beels hold major fishery resources contributing to around one-fourth of the fish production in the state. Major portions of beels, however, have been rendered unproductive due to excessive siltation and growth of weeds, and presently only around 30 percent of the total beel

area (33 400 ha) is being utilized for fishery purposes. Development of beels could be achieved by dredging and deepening connecting canals, removing weeds and making suitable changes in leasing policies. The production potential of beels could be increased to 1 000–1 500 kg/ha through scientific management.

Beels and the wetlands surrounding them are treasure houses of biodiversity and natural buffer areas to contain flood waters. Hence, a strategy of responsible development through ecologically friendly aquaculture is to be adopted. Out of the total beel area, about 30 percent could be brought under extensive fish culture over a period of five years through the following strategy:

- identification of suitable beels with high biomass potential, unaffected by regular flooding, free from pollutants, and having conducive ownership arrangements;
- survey of beels and estimation of cost of development involving the construction of embankments for flood control, removal of weeds, dredging and other costs;
- preparation of a master plan for beel development based on carrying capacity of beels, seed rearing in pens/cages, stocking of beels and their sustainable exploitation;
- leasing of beels on a long-term basis to cooperatives, SHGs, farm management committees or individuals, and authorizing leaseholders through clauses in lease deeds to mortgage the water body for the lease period to a financing bank for the specific purpose of securing a bank loan;
- provision of extension services and training to leaseholders against payment of fees for scientific development, management and exploitation of a leased water body;
- development of linkages for input supply, monitoring and marketing.

Utilization of rice fields and low-lying areas for fish culture

Assam's rice growing area covers 2.5 million ha of land, of which about one million ha are rainfed lowlands that are suitable for rice-cum-fish farming. The Brahmaputra valley in particular offers great scope for rice-cum-fish farming due to its high rainfall, which causes the low-lying rice fields to be covered with water for prolonged periods from 3 to 8 months. It is estimated that about 20 000 ha of rice fields could be brought under rice-cum-fish culture with an average production of 700 kg/ha.

In addition to these lands, low-lying, water-logged lands under private ownership can be developed into fish ponds at moderate expenses. Semi-intensive as well as intensive culture systems can be practised in these newly created water bodies and managed by private entrepreneurs.

The following strategy can be adopted for the utilization of rice fields and low-lying areas for fish culture:

- conducting resource potential surveys at the district and block level to identify water areas that can be developed for scientific poly-culture of fish and rice-cum-fish culture;
- preparing district and block master plans covering the prospective activities in each area with detailed cost estimates and identification of entrepreneurs desirous of undertaking intensive fish culture in newly created water bodies;
- establishing an extension and training system for forward and backward linkages and training of farmers.

Ornamental fish trade

There are about 128 native species of ornamental fishes in Assam and other northeast Indian states, which account for 85 percent of all exports of ornamental fish from India. In addition, there is a domestic market for exotic ornamental fishes. The present domestic demand for ornamental fish is about INR500 million per year and the demand is increasing at the rate of 20 percent annually. The total value of exports of ornamental fish is US$427 million. The major markets are the United States, Europe and Japan. Singapore is the hub centre for the ornamental fish export trade.

The State of Assam has favourable climatic conditions for the growth of ornamental fishes. Presently, the production comes mainly from the collection of ornamental fish from beels, swamps, low-lying areas, hill stream, lakes and other natural resources that are home to endemic ornamental fishes. It is estimated that about 20 percent of fish caught for consumption is considered ornamental fish in other countries.

The development of the sector requires strategies involving the sustainable exploitation of the existing natural resources as well as the breeding and rearing of native and exotic varieties under controlled conditions. Stocking of large varieties of ornamental fish in adequate quantities throughout the year is a pre-requisite for their export. It is estimated that at least 50 varieties of fish should be available in order to start an effective export business and to realize competitive prices. In order to take advantage of the availability of a large number of varieties, a strong supply chain needs to be established starting from fish collectors and involving agents, dealers and exporters.

Suitable breeding facilities for exotic and indigenous ornamental fish can be created in areas that have favourable climatic conditions and adequate unpolluted water available. A moderate-size breeding centre would consist of a cemented cistern, a filtration unit, aquarium tanks, a pumping system and a small laboratory. The unit may also need appropriately-sized holding tanks for keeping fish prior to transport and earthen stocking ponds. Such breeding centres can also serve as receiving points for ornamental fishes collected from the wild and as marketing centres. A viable model for ornamental fish export trade consists of a medium or large-scale breeder/grower-cum-exporter supplemented by a number of small local ornamental fish breeders and collectors.

India exports ornamental fish worth INR15.823 million, of which INR14.256 million is contributed by West Bengal. It is estimated that ornamental fish worth more than INR11.000 million is exported through Kolkata Airport alone. With the upgrading of Guwahati Airport to an international airport, the ornamental fish export could get a boost since exporters can send fish directly to foreign countries instead of sending it first to Kolkata.

Rehabilitation and conservation of fishery resources and aquatic environment

Conservation programmes require the participation of government agencies, the general public, scientists, planners and administrations. Conservation planning largely depends on reliable scientific data, which is widely lacking in Assam. One of the main constraints to the conservation of fish biodiversity, i.e. overfishing, is difficult to address because of the present socio-economic conditions prevailing in the state, which are characterized by poverty and a lack of alternative employment opportunities. Conservation of genetic diversity is nevertheless essential, both for aquatic organisms and the people who ultimately benefit from them.

The simplest approach of preservation is to proclaim certain stretches of rivers, tributaries, beels, hills streams and reservoirs as sanctuaries; public awareness, participation and cooperation are of vital importance for their management. Regulatory measures and their enforcement, such as prevention of fishing in sanctuaries and during breeding seasons, regulation of mesh sizes, and similar measures would serve the purpose of biodiversity conservation to a certain extent. The conservation of genes in gene libraries also needs to be initiated. While raising public awareness of the need for conservation is important, equally so is the funding and encouragement of biodiversity assessment endeavours, which hold the key to the whole exercise of fish conservation.

3.8 Action to be taken at various levels

State Government – Department of Fisheries

The extension services of the Department of Fisheries of Assam need to be strengthened to ensure dissemination of scientific technology and information at the field level, and

to popularize the concept of beel fisheries development and the adoption of pen culture methods. In the absence of adequate extension services from the government, NGOs can play an active role as disseminators of technical knowledge at the village level. Technical personnel of the Department of Fisheries may be utilized to train NGOs on the management of fish farms, breeding technology and various aspects of project formulation and implementation.

The lack of good quality seed of proper size for stocking is a major constraint to fisheries enhancement and aquaculture in Assam. Hatcheries established in the government sector need to be renovated and made operational. The state government should conduct a survey of the present state of government-owned hatcheries and implement an action plan for their revival. In order to encourage private investment in the field of hatchery production of fish seed, the Department of Fisheries should formulate a standard package of practices to be adopted by hatchery operators and arrange for training programmes for farmers at the district level on appropriate technologies for selective breeding, brood stock management, hatchery operation and nursery management.

Concentrated efforts should be made by the Department of Fisheries to popularize new and innovative activities such as pen culture and ornamental fish and freshwater prawn stocking in beels. Essential infrastructure and training of production and extension personnel must be set up on a priority basis.

The Government of Assam may insert a clause in their lease deeds stating that beels leased to fish farmers could be mortgaged to banks for the period of the lease to facilitate obtaining a bank loan.

Banks

Banks should play an active role in extending credit facilities for all techno-economically viable fisheries projects. They may function in close coordination with the Department of Fisheries to ensure effective implementation of the schemes financed by them. Banks may re-examine the collateral requirements for financing the development of beels held by individuals or group of farmers on a long-term lease. They may consider accepting mortgage of lease title deeds issued by the state government as primary collateral for receiving a bank loan.

Microfinance

There is scope for greater participation in microfinance programmes by commercial banks in Assam. Progress and problems of the SHG-Bank linkage programme need to be discussed regularly in the Block Level Bankers' Committee (BLBC) and in District Level Coordination Committee (DLCC) meetings. Microfinance programmes need to be incorporated in the service area plans of banks. Banks may consider lending to SHGs as part of their mainstream credit operations, both at the policy and implementation level.

According to the Government of India's directives, one third of the rural poor, including fishers, should be covered under the SHG-Bank linkage programme by 2008. This will be possible only with the increased support from the state government in promoting, guiding and nurturing SHGs of fishers.

The state government should also consider the waiving of stamp duty in the case of loans taken by SHGs in order to reduce the cost of lending. An amendment to the Cooperative Societies Act and Regulations and an amendment to by-laws of cooperatives are required to enable cooperative credit institutions to provide credit to SHGs.

Since the group approach of SHGs is given importance under the SGSY programme for generating self-employment among the rural poor, there is a need to sensitize officials of District Rural Development Agencies (DRDA) and block level functionaries, and to encourage coordination among government functionaries, banks and NGOs in the

implementation of the programme. Similarly, there is a need for better coordination between NGOs working in the field of microfinance and DRDAs to improve the SHG movement in the state. Coordination is also needed for collecting data on the implementation of programmes, setting up databases and sharing information.

Social work volunteers such as the Vikas Volunteer Vahini Clubs (VVV Clubs) as well as Anganwadi workers should also become involved in the promotion of SHGs among inland fishers. Organizations and institutions promoting SHGs may design innovative and fully participatory models for entrepreneurship and skills development, encourage rural people to start micro-enterprises, and provide guidance and technical support.

4. WEST BENGAL

4.1 Overview

West Bengal has always been at the top at the national level in terms of inland fish and seed production. There are 1 288 027 persons involved in inland fisheries and freshwater aquaculture and 199 122 in marine fisheries. The State of West Bengal has also the highest consumption of fish in India. The per capita fish demand is estimated as 15.6 kg, which is above the world average of 13 kg and the national average of 9 kg. Presently, the state has a supply-demand deficit of 48 000 tonnes of fish, which has been decreasing over the last five years, as shown in Table 5. The production figures include the marine fisheries production. The inland fishery resources of West Bengal are shown in Table 6.

West Bengal also has the most important inland fish market of India and is strategically located at the junction of trade routes where inland fish is moved from the southern, northern and western markets to the eastern and northeastern regions and fish consumer centres.

Although the development of the inland fisheries sector of West Bengal is impressive, the average annual productivity is presently only 2 350 kg/ha, which is still lower than the productivity levels attained in other Indian states such as Punjab and Andhra Pradesh.

4.2 Status of inland capture fisheries

4.2.1 Development of beels, bundhs and reservoirs

Beels, bundhs and reservoirs are potential resources for augmenting fish production and generating additional employment. These larger water bodies are presently being utilized for fish production by fishermen cooperative societies with financial and technical assistance from the Fisheries Department of West Bengal, and financial assistance from the National Cooperative Development Corporation (NCDC). Due to the sustained efforts of these organizations, the annual productivity of the beels has been raised from 150-200 kg to 1 000-1 200 kg/ha. Similarly, the annual productivity of reservoirs has been increased from 60-50 kg/ha to as much as 600-800 kg/ha.

Over the years, however, heavy siltation has taken place in many beels and their reclamation and development have become an urgent necessity. During the first phase of the beel fisheries development project – under the leadership of the West Bengal State Fishermen Cooperative Federation (WENFISH), the apex cooperative body of the state fishermen cooperatives, with the financial assistance of NCDC – 87 beels comprising an area of 5 387 ha are being developed in the district of North 24 Parganas as well as additional areas in Nadia, Murshidabad, Hooghly, Uttar Dinajpur and Dakshin Dinajpur Districts.

Since the amount of funds required for the reclamation of all beels in the state exceeds the budget allocations of the concerned government agencies, the Government of West Bengal should explore the possibility to use the facilities available under NABARD's Rural Infrastructure Development Fund (RIDF) for this purpose.

TABLE 5
Demand and production of fish in West Bengal, 1998-2003

Year	Demand (tonnes)	Production (tonnes)	Deficit
1998-1999	1 093 000	995 000	98 000
1999-2000	1 115 000	1 045 000	70 000
2000-2001	1 135 000	1 060 000	75 000
2001-2002	1 158 000	1 100 000	58 000
2002-2003	1 168 000	1 120 000	48 000

Source: Fisheries statistics 2002-2003, Directorate of Fisheries of West Bengal.

4.2.2 Freshwater prawn farming

The culture of freshwater prawns in paddy fields, locally known as Bhasabada, has become increasingly popular and provides income for thousands of fish farmers in West Bengal in nine districts of the state. Table 7 shows the area under this traditional type of fish farming and production.

TABLE 6
Inland fishery resources of West Bengal

Total tank area (ha)	276 201
Area suitable for freshwater fish culture (ha)	194 113 088
Rivers (km)	172 586 036
Beels and baors (ha)	41 781.65
Reservoirs (ha)	1 673 880
Canals (km)	80 085.71
Brackishwater area (ha)	210 000
Marine coastline (km.)	158 km
Inshore area up to 10 fathoms	70 km^2
Offshore area 10-40 fathoms	181.3 km^2
Continental shelf up to 100 fathoms	17 049 km^2

4.2.3 Sewage fed fisheries

The sewage-fed fishery east of Kolkata is a unique example of the natural recycling of organic waste and its use for fish farming. The wetlands east of Kolkata, popularly known as *bheries*, host the world's largest sewage-fed fishery, which once produced annually as much as 300 000 tonnes of table fish. The fishery is now under constant threat of closure because of increasing land reclamation due to urbanization. The area under fish culture was reduced from 10 000 ha to 4 000 ha. To give due emphasis to this fishery, and in consideration of its role in organic waste recycling, the Fisheries Department of West Bengal has made serious efforts to preserve the remaining East Kolkata wetlands. At the same time, two new sewage-fed fisheries have been established at Nabadwib in Nadia District and Srirampore in Hooghly District.

4.2.4 Ornamental fisheries

There is a growing global demand for ornamental fish. Table 8 shows the recent increase in their export from India and West Bengal, which accounted for as much as 80 percent of India's ornamental fish export in 2002-2003.

TABLE 7
Traditional freshwater prawn farming in West Bengal

District	Area under prawn culture (ha)		Production (tonnes)	
Year	*2000-2001*	*2001-2002*	*2000-2001*	*2001-2002*
North 24 Parganas	1 220	1 350	42.24	46.23
South 24 Parganas	720	770	50.4	43.3
Midnapur	580	630	14.8	35.5
Hooghly	260	290	0	16.4
Howrah	180	205	10.8	11.5
Bardhaman	110	120	0	6.8
Nadia	280	295	0	16.6
Murshidabad	110	110	0	6.4
Bankura	220	250	16.5	14.1
Total	3 680	4 020	134.74	196.83

Source: NABARD West Bengal State Credit Seminar paper.

TABLE 8
Value of ornamental fish export from India vs West Bengal, in INR million

Year	India	West Bengal	Share (in %)
1999-2000	17.493	16.32	93
2000-2001	22.6	17.056	75
2001-2002	31.4	17.82	57
2002-2003	36.7	29.36	80

Source: NABARD West Bengal State Credit Seminar paper.

TABLE 9
Disbursement of GLC and credit for fisheries in West Bengal, 1998–2003, in INR million

Year	Total GLC	GLC for fisheries	Share of fisheries in total GLC (%)	NABARD refinance for fisheries	Share of refinance in GLC for fisheries (%)
1998-1999	4 782.616	194.936	4.07	22.250	11.41
1999-2000	5 936.333	142.328	2.39	21.498	15.10
2000-2001	6 635.474	175.133	2.63	48.199	27.52
2001-2002	7 777.706	182.661	2.34	58.854	32.21
2002-2003	8 582.709	161.475	1.88	66.760	41.34

Source: NABARD West Bengal State Credit Seminar paper.

4.3 Institutional credit and microfinance

4.3.1 Fisheries credit

Table 9 shows the comparative position of the ground level credit (GLC) for all sectors of the economy of West Bengal from 1998 to 2003 regarding GLC and NABARD refinance for the fisheries sector, both inland and marine.

While the total GLC to all sectors steadily increases from year to year, GLC for fisheries shows a different picture. The trend in total GLC disbursement to the fisheries sector of West Bengal, extended by various agencies, fluctuated from year to year and actually declined, from INR194.936 million disbursed during 1998-1999 to INR161.475 million disbursed during 2002-2003.

The share of NABARD refinance used by the financial agencies and institutions that provided credit for fisheries considerably increased while they used less and less of their own funds. The share of refinance in the total GLC for fisheries thus increased from as little as 11.41 percent during 1998-1999 to as much as 41.34 percent during 2002-2003.

Even though the fisheries sector is doing well in terms of repayment of loans compared to other sectors, financial institutions are still reluctant to use more of their own funds and to extend full support to the sector. Credit support from financial institutions in West Bengal for inland fisheries has even been more modest than for marine fisheries. However, the National Cooperative Development Corporation (NCDC) has been financing fisheries development in beels. Five projects worth INR339.215 million for the development of beels through fishermen cooperative societies were financed, as shown in Table 10. New methods for crab fattening were introduced as part of these projects.

For the purpose of sewage-fed fishery development, Syndicate Bank provided credit to three companies: *Agro Fisheries Limited*, Bidhan Nagar, started a sewage fed fishery in a 65 ha water area with the help of a capital investment loan of INR2.4 million and a working capital loan of INR1.3 million; *Aquatic Agro* received an INR1.8 million capital investment loan and an INR1 million working capital loan for a 21 ha water area; and *Aquatic Agro–II* received an INR2.8 million working capital loan for sewage-fed fishery development in a 21 ha water area.

4.3.2 Microfinance

The programme of linking SHGs to bank finance was launched by NABARD in February 1992 at the national level. In the state of West Bengal, the first three SHGs

TABLE 10
NCDC-financed projects for the development of beel fisheries in West Bengal

Name of the project	Financial assistance (INR million)	Area (ha)	No. of groups
Development of beel fisheries in 6 districts of West Bengal, Phase I	43.9330	4 412.39	90
Development of beels in 2 districts of West Bengal	23.8628	614.21	15
Reservoir development project in Bankura and Purulia Districts	55.5370	4 716	21
Integrated project in Nayachar Island in Midnapore District, involving 13 primary fishermen cooperative societies	169.5000	8 250	13
Ornamental fish farming by fisherwomen cooperative societies – 24 Parganas	4.1178	460 units (35 members per unit)	12
Mud crab farming by cooperative societies in the Sunderban Delta	5.2043	95 units (45 units for crab culture and 50 units for crab catchers)	4

Source: National Cooperative Development Corporation Annual Reports.

were linked with Sagar Grameen Bank in 24 Parganas (N) District. Thereafter, the growth rate of the formation and linkage of SHGs was slow until it gained momentum from 1998-1999 onwards, when 1 198 SHGs were linked with various commercial, cooperative and regional rural banks (RRBs). By 1999-2000, as many as 3 249 SHGs had been linked to financial institutions.

As of 31 March 2004, 907 branches of 9 RRBs, 207 branches of district central cooperative banks (DCCBs), 2 142 Primary Agricultural Cooperative Societies (PACS) affiliated to District Central Cooperative Banks and 307 branches of commercial banks have been participating in the *SHG-Bank Linkage Programme*. More than 200 NGOs and some government departments have started promoting SHGs and linking them to banks.

Since members of SHGs carry out a variety of economic activities, it is difficult to indicate the exact number of SHGs engaged in inland fisheries activities. It is estimated, however, that about 20 percent of SHGs are engaged in inland fisheries activities. The annual household income of members of these SHGs ranges from INR2 000 to 6 000. The average size of microcredit taken by the SHGs ranges from INR5 000 to 8 000. Most loans are being used for fish marketing, fishing, net making, the purchase of fishing boats, ornamental fish breeding and rearing, preparation of ready-to-eat fish products such as fish cutlets, wafers and pickles, as well as for crab fattening.

4.4 Constraints to inland fisheries development and its financing in West Bengal

Floodplain and wetland fisheries

Floodplains and wetlands are considered ecologically-sensitive areas of high biodiversity that support many unique aquatic plants and play a vital role in the recruitment and growth of many economically important riverine fish populations. They often provide essential wintering grounds for many migratory birds in addition to being closely linked with a variety of vital economic activities in rural areas. They further provide water for drinking and irrigation, transport and communication routes, protein and other nutrients, building materials, and fertile land for agriculture. They also play a very significant role for the fisheries in this region, providing habitat for the prime fishery resource. Floodplains and wetlands offer a vast potential for capture fishery as they are naturally stocked with fish seed from rivers. Since floodplains and wetlands are rich in nutrients, they offer a suitable environment for the growth of fish.

Unfortunately, scientific data on floodplains and wetlands in West Bengal are lacking. Socio-economic data on wetland values and usage are also not available. Even names and areas of wetlands are not readily available. There is a lack of adequately trained manpower for wetland development and management as well as a lack of coordination between agencies responsible for wetlands. There are also conflicts of interest. While

fishers and fisheries managers are in favour of the removal of weeds, environmentalists suggest maintaining them as a part of biodiversity.

Floodplains and wetlands are under the control of the state government and its various agencies, and are leased out to individuals or cooperative societies for a fixed period of time. The lease agreement generally provides a clause to properly maintain the wetland fishery without any damage to the ecosystem. Lack of proper monitoring and supervision make this clause less effective and many developed wetlands revert to a pre-developed stage when leased.

Development of wetlands is a massive task. It is obvious that work of this magnitude needs large amounts of funds. As West Bengal is facing serious financial problems, many development projects of wetlands are being discontinued.

Reservoirs and beels

There is a lack of funds to conduct applied research into appropriate technologies for enhancing fish production in reservoirs and beels, as well as a lack of financial and government support.

Credit and microfinance

Inland fishers and fish farmers in West Bengal do not have proper access to, and absorption capacity for, credit and microfinance services due to the following constraints:

- lack of collateral and insurance cover, which discourages lending by banks;
- lack of entrepreneurship and business management skills of fishers and fish farmers, which are required for making proper use of credit and microfinance;
- lack of facilities for testing soil, water and feed quality, and other relevant parameters that are a pre-requisite for obtaining credit from financial institutions for fish farming;
- reluctance of financial institutions to finance fisheries even though the sector has a better repayment record than other sectors;
- lack of freshwater prawn seed, which hampers freshwater prawn farming development and hampers the use of supporting credit facilities;
- the practice of long-term leasing of multi-ownership ponds for fish farming without written lease deeds, which does not allow financial institutions to provide credit;
- lack of awareness about microfinance programmes in inland fisheries.

4.5 Opportunities for inland fisheries development in West Bengal

The following opportunities are identified for developing inland fisheries in West Bengal:

- rehabilitation of beels and development of beel fisheries;
- development of reservoir fisheries;
- infrastructure development of fish marketing facilities, access roads to inland water bodies, landing sites, fishing villages and hatcheries;
- expansion of crab fattening in the Sunderban area;
- formation of more SHGs of inland fishers and fishery-related micro-enterprise development;
- establishment of a regulatory framework for the import of fish germplasm as well as quarantine regulations for ornamental fish production and trade.

Regarding the provision of microfinance services for inland fishers and fish farmers, there is an urgent need to expedite the implementation of the policies of the Reserve Bank of India in West Bengal. Lending to SHGs should be considered a normal lending activity and part of the banks' mainstream lending operations, both at the policy and implementation level. Financing SHGs has been accepted as a separate segment under

priority sector lending; hence, priority may be given to its financing. Similarly, lending to SHGs should be a part of the area service plan of any bank branch.

In order to increase the number of partner banks, NABARD may conduct extensive awareness-generation programmes for bank officers with special emphasis on Regional Rural banks. NGOs and VVV Clubs should also be encouraged to participate in such programmes.

4.6 RECOMMENDATIONS FOR INLAND FISHERIES DEVELOPMENT IN ASSAM AND WEST BENGAL

The following recommendations are made for developing inland fisheries in India in general, and in the States of Assam and West Bengal, in particular:

- Specific development programmes for the optimization of fish yields in inland waters should be formulated and implemented. The objective would be the optimization of fish yields for different categories of reservoirs, to be achieved by stocking of these reservoirs with fish seed; supply of appropriate fishing craft and gear, where needed; the construction and supply of ponds, cages and pens for raising of fish; the construction and equipment of fish landing centres with platforms, sheds and cold rooms for storing and packing of fish and ice; the construction of sanitary facilities, the supply of water and electricity and other facilities and services. As far as the creation of infrastructure is concerned, the Rural Infrastructure Development Fund (RIDF) of NABARD should be used. A cluster approach should be adopted for value addition through freezing, smoking, drying or other types of fish processing.
- The organisation of cooperatives and SHGs among inland fishers should be actively promoted and their involvement in fishing, fish farming, processing and marketing activities facilitated.
- Capacity building and training programmes are needed for fisheries departments and other concerned government officers, members of cooperative societies, fisher and fish farmer SHGs on all topics, which are relevant to the development and rehabilitation of inland capture fisheries and fish farming.
- The rehabilitation and conservation of commercially important fish species in riverine systems and floodplains through ranching and habitat restoration should be actively pursued.
- A uniform legislation for riverine fisheries is urgently needed. Rivers in India cut across geographical boundaries of different states. Conservation and sustainable exploitation measures taken in one particular state need to be complemented by neighbouring states located up- and downstream according to mutually agreed principles of responsible fisheries. To guide and facilitate a compatible legislation in neighbouring States, the Central Government may consider formulation of a model bill and its circulation to States and Union Territories to help them in formulating and enacting their own fisheries Acts.
- There is an urgent need to strengthen applied research on inland capture fisheries by the Indian Council of Agriculture Research (ICAR). The major areas of this research relate to technologies for enhancing fish production and productivity of inland waters; better resource management including participatory management practices; economically efficient use of craft and gear and the efficient use of financial resources.
- The restoration of habitat and upland aquatic resources entails a broad integrated approach taking into account the requirements of fisheries and of other users. Regulation of fishing effort should include the strict enforcement of fisheries rules, rejuvenation of endangered species through stocking programmes, protection of natural breeding grounds and the establishment of sanctuaries for the restoration of depleted gene pools.

- Fish sanctuaries should be further developed into "ecological parks" and become a destination for eco-tourism. This will increase public awareness and support for the conservation and rehabilitation of the aquatic environment and also generate economic benefits for rural communities. At present, there are about 200 fish sanctuaries located in different parts of India, which are already instrumental in preserving the original germplasm pool, boosting tourism and imparting awareness to the new generation about the precious fish wealth of the country.
- The Government should actively promote the strengthening of databases on inland water and fishery resources and their exploitation as well as the sharing of information and networking by the various agencies, which are involved in the management and development of inland fisheries. The availability of basic data on various aspects of inland fisheries such as the size of surface waters, ecological conditions, abundance and status of fish stocks, the number of fishers and their vocational and socio-economic status, production, processing and marketing and other data are a prerequisite for formulating sound development plans.
- More emphasis needs to be given to the rehabilitation and proper management of fisheries in hilly and mountainous areas. Cold water fishes like Mahseer, trout and other fishes are of great national significance and highly acclaimed sport and food fishes of hilly regions in India. Despite their abundance at one time, their stocks are declining rapidly. Keeping in view the importance of these fisheries, there is an urgent need for more concerted efforts in research and development by all organizations involved.
- As the required credit is not flowing for inland fisheries due to various constraints, it may be advisable to formulate special banking plans for the development of beel, upland and hilly fisheries so that the required credit support can be provided.
- The lending to SHGs through microfinance is the most suitable credit system for small-scale inland fisheries development and needs to be encouraged by implementing awareness programmes as well as capacity building measures for all stakeholders.
- To strengthen the focus on inland fisheries development in national planning, it is necessary to avail assistance from international organizations, i.e. FAO, UNDP, Asian Development Bank, World Bank and others for the preparation and execution of pilot projects involving technological and financial support.

V. Institutional credit and microfinance in Myanmar, with special reference to livelihoods at Lake Inlay, Southern Shan State

By Nu Nu Aye and Khin Maung Win

1. INTRODUCTION

In order to provide food for a rapidly increasing population, FAO's Strategic Framework for 2000-2015 and its corporate strategies aim at reducing food insecurity and rural poverty, providing sustainable rural livelihoods and more equitable access to resources and thereby contributing to an important millennium goal. The 26th Session of the FAO Committee on Fisheries highlighted that small-scale fisheries are critical in many poor countries for the provision of income, employment and food security. Microfinance programmes have proven to be very effective and powerful tools for reducing poverty as acknowledged by the United Nations General Assembly (UNGA) Resolution 52/194 of 18 December 1997. The 26th Session of the FAO Committee on Fisheries also highlighted the need for capacity building for fishing communities to enable these communities to fully participate in efforts to rehabilitate and conserve aquatic resources.

Myanmar is one of the poor developing countries in Asia with a population of about 53 million. It is endowed with abundant natural resources including 1 500 km of coastline stretching from the Nerve River in the north to Victoria Point in the south. There are three main river systems, which flow from the highlands in the north to the lowlands in the south, and from there into the Gulf of Mottama (Mattaban). Several species of fish are abundant in these areas and are exploited by various types of fisheries.

The formal credit sector also supports fisheries, but only on a limited scale. The credit sources are the state-owned Myanmar Economic Bank (MEB) and the Myanmar Agricultural Development Bank (MADB). Traditionally, MEB supports trade and marketing activities, while MADB disburses loans for capital investments in the agricultural sector, which also includes livestock and fisheries.

Following the financial sector reform of 1990, three types of financial institutions can be distinguished: the Central Bank of Myanmar, commercial banks including private banks, and the Myanmar Agricultural Development Bank. As far as the commercial banks are concerned, by the end of 1997, 20 private banks had been established in Myanmar. However, only few of these banks, such as Asia Wealth Bank, Kanbawza Bank, Myanmar Mayflower Bank, Yoma Bank and Myanmar Universal Bank, have a substantial capital base. Private banks in Myanmar generally do not serve as a source of finance for small-scale farmers and fishers, but cater mainly to the requirements of trade and construction. The privately owned Myanmar Livestock and Fisheries Bank was established in 1994 with the aim of providing financial support to the livestock and fisheries sectors.

As the fisheries sector is considered one of the most important sectors for the development of Myanmar's economy, the Ministry of Livestock and Fisheries has prepared plans to promote and expand aquaculture, fisheries and fisheries-related

TABLE 1
Water inflow into Lake Inlay

Inflow system	Catchments areas (square miles)	Average annual inflow (Acre feet)	Rainfall (inches)
Balue Chaung	312.00	759.00	74
Than Taung Chaung	256.00	334.00	45
Small creeks in the west (Kalawt Chaung & others)	18.80	5.00	45
Small creeks in the east	65.00	39.00	46
Nant Latt creek in the north	No figure available	No figure available	No figure available

Source: Report of the Irrigation Department of Myanmar, 2002.

industries. Rural development and poverty reduction are also considered a priority concern in the country. In spite of this policy and planning scenario, bank loans rarely reach the fundamental stakeholders in the process of poverty reduction and rural development, i.e. small-scale fishers and farmers for whom access to microfinance is essential for the improvement of their livelihoods.

This report focuses on the livelihoods of small-scale fishers in Myanmar with a special emphasis on the need and scope for microcredit support and on the potential for a sustainable use of the aquatic resources in the Lake Inlay environment. The report was prepared by the Myanmar participants in the Kuala Lumpur Workshop. The authors sincerely hope that this report and its conclusions may benefit those who are involved in efforts to reduce poverty in the country.

2. THE LAKE

2.1 Location and general characteristics

Lake Inlay is located on the Shan Plateau of Myanmar between latitude N19°58'11" to 20°45'45" and longitude E97°46'30" to 97°55'30". It is the second largest lake in Myanmar, after Indawgyi Lake in Myitkyina, Kachin State in the northern part of Myanmar.

Lake Inlay is a natural lake situated approximately 2 900 feet (883.92 m) above sea level in a broad valley between two limestone ranges to the east and the west. The eastern ranges of the lake include Sin Taung, Myin Ma Hti Taung, and the western ranges include Odaung Taung, Letmaung Kwae Taung and Than Taung. To the north, Lake Inlay is connected with Sagar Lake.

According to a 1995 survey report, the water surface of the lake is about 23 square miles (59.6 km^2) and has a distance of seven miles from Inle Village in the south to Nant Pan village in the north. The width of the lake is almost three miles from east to west. The reed and marshy areas along the perimeters of the lake are generally covered with water during the rainy season. The maximum depth of the lake is about 12.5 feet (.381 m) and the water volume is estimated as 171 400 acre feet[1] in the rainy season.

Geologically, it is assumed that the lake was formed during the Tertiary Period, 350 to 400 million years ago. It is also believed that the whole Nyaungshwe plain or basin was once under water and formed a much larger lake with water levels more than 300 feet (91.44 m) deeper than at present. The present Lake Inlay was formed when the water retreated; it is further assumed that the dissolving of limestone at the bottom of the lake also contributed to its formation.

2.2 Water flow and quality

As seen in Table 1, the main rivers flowing into Lake Inlay are Balue Chaung and Than Taung Chaung. There are also many smaller streams and creeks that flow into the lake, i.e. Yae Pae Chaung, Inn Tain Chaung, Nant Lat Chaung, Shwe Lin Pan Chaung, Nant Maecin Chaung, Tha Lae Oo Chaung, Ma Kyi Seik Chaung, and Ma Kyi Pin Chaung.

[1] An acre foot is equivalent to 1233.489238 cubic metres.

While the water is generally clear, a large portion of the lake is covered with growth of submerged and floating leaved macrophytes. There are also colonies of blue and green algae growth in the open water. The water quality has been recorded as follows: pH: 7.6-8.3; conductivity: 260-410 μS/cm and dissolved oxygen: 1.7-10.3 mg/litre. Dissolved oxygen levels of 10.3 ppm are found in the surface waters, while 1.7 ppm dissolved oxygen is found near the bottom of the lake. Some degree of domestic pollution has been found in the channel just downstream of Nyaung Shwe.

3. HABITAT, FAUNA AND FLORA

As many as 43 fish species, three species of freshwater turtle and tortoise, and 29 species of butterflies live in and on the lake. According to a survey team of biologists from Myanmar and the California Academy of Science, San Francisco, California, United States of America, examining Lake Inlay in August 2002, there are 25 species of amphibians and reptilians to be found in and around the lake.

Lake Inlay is one of the most important in southeast Asia because of its diverse fish genera and endemism. Among the indigenous fish species, about 50 percent of the total fish fauna in the lake is endemic. With the aim to control submerged weed and macrophytes in the lake, the Department of Fisheries introduced non-indigenous fish species such as grass carps and Indian carps *(Ctenopharynodon idella* and *Rohu Labeo rohita)*, *Trichogester pectoralis*, *Tilapia* spp., *Clarias gariepinus*, *Parambassis* spp. and *Glossogobius* spp.

The indigenous fish species found in Lake Inlay are *Notopterus notopterus, Clarias batrachus, Monopterus cuchia, Monopterus albus, Channa striata, Chaudhuria caudata, Lepidocephalichthys berdmorei, Acanthocobitis botia, Physoschistura rivulicola, Puntius stoliczkanus, Colisa labiosus, Parambassis* spp., *Labeo rohita and Ctenopharyngodon idella.* The endemic species include *Cyprinus intha, Neolissochilus nigrovittatus, Cirrhinus* spp., *Physoschistura shanensis, Yunnanilus brevis, Sawbwa resplendens, Microrusbora rubescens, Danyo erythromicron, Inlecypris auropurpures, Poropuntius schanicus, Poropuntius* spp., *Garra gravelyi, Channa harcourtbutleri, Macrognathus caudiocellatus and Mastacembelus oatesii.*

The complexity of the natural environment of Lake Inlay, which consists of wetland habitat, mixed deciduous forests and conifer forests, is responsible for a great diversity of birds. The lake itself provides habitat for 29 species of water birds and 28 species of other birds. Altogether, 240 species of birds have been recorded on the lake and in the surrounding forests. These include vulnerable and endangered species such as Jerdon's Bush chat, sturnid, eastern sarus crane, greater spotted owl, bear's pochard, Indian skimmer duck, ferruginous duck, mandarin duck, bar headed goose and lesser kestrel.

The lake also provides habitat for a large variety of mammals including civet cats, muntjac (or barking) and sambar deer, golden jackal, hare, mongoose, otter, serow, black bear, porcupine and other animals.

Much of the lake is covered with growth of submerged and floating leaved saprophytes. Grass (*Eichhornia* and *Ploygonum*) and macrophytes form floating mats. There are extensive areas of grass mats and herbaceous marsh, especially at the northern end of the lake. Grass mats and herbaceous marsh are anchored by farmers and used as paddy fields and floating gardens. There are records of some underground water flows in Lake Inlay that provide peculiar habitats.

The lake has diverse flora with its 1 688 species of plants, 527 herb species and 217 native species of orchid recorded in and around the lake. Most of the bottom of the lake is normally covered with submerged plants. The aquatic flora can be subdivided into amphibious, creeping, emergent, free-floating, submerged rooted and submerged non-rooted flora and floating leaves. *Eichhornia crassipes*, *Salvinia* sp, and *Pistia stratiotes* are the most common examples of the free floating flora that grows in hard water. Floating leaves are represented by species of *Potamogeton, Nymphacea* and *Nymphoides.* They

provide habitat and feed for small fish. Common submerged rooted flora in Lake Inlay are *Chara, Nitella* and *Najas* species. The submerged non-rooted flora consists of *Elodea* spp., *Hydrila verticillata* and two species of *Utricularia* and *Cerratophylum*. These submerged plants are the main oxygen producers in the lake and also provide shelter for small fish. Utricularia grows well in water or in swamps. The amphibious flora is represented by species of *Marsilea, Colocasia, Polygonum* and *Alternanthera*. Common creeping flora in the lake is represented by *Ludwegia adscendens, Ipomea aquatica* and the grass species of *Echinochloa*. Emergent flora consists of *Phragmites* spp, *Typha* spp, *Nelumbo nucifera, Saggitaria* spp and *Saccharum* spp.

4. ECONOMIC IMPORTANCE AND LIVELIHOODS AT LAKE INLAY

In the vicinity of Lake Inlay and its surrounding hills and valleys in Taunggyi District of Southern Shan State, there are 456 villages and the township of Nyaungshwe with altogether about 120 000 inhabitants. The local people living in and around the lake are called Intha. They live in houses constructed on stilts in the waters on the lakeshore. Their principal means of transport are canoes with and without outboard engines. The traditional way of rowing canoes by using feet rather than hands can only be seen at Lake Inlay. The livelihoods of local people are based on fishing, weaving and on working as blacksmith and silversmith. Throughout Myanmar, Intha are known for their skills of weaving silver yarn used for robes with lotus flowers for donations to Buddha and for their skills as silversmiths.

The lake provides income and employment for about 350 fisher families with 768 active fishers, and an estimated 100 weed collectors for grass carp and pig farms in the surrounding and adjacent valleys.

The most common fishing gear used by 350 fishers is gillnet, followed by forks and spears (135 units), hook and lines (110 units), basket traps (100 units), and other types of traps and gear (73 units). The replacement cost of fishing gear ranges from as little as Kyat2 000 for a spear to as much as Kyat8 000 for a gillnet.

The lake is also important as one of the main tourist attractions in southern Shan State. Between 1 000 to 1 500 tourists visit Lake Inlay daily from October to January each year. A newly established bird sanctuary will attract even more tourists. The amount of fish harvested from the lake is estimated at between 550 and 600 metric tonnes/year by using traditional fishing methods. In addition to capture fisheries, there are 500 acres of fish ponds on the lakeshore, which produce 750 tonnes of fish per year. Fish is the main source of animal protein for eight months in a year for the village communities in the vicinity of the lake. The lake also provides livelihoods for families practising traditional vegetable growing in floating gardens. Their small plots cover almost 2 400 ha and 14 percent of the lake's area.

5. ENVIRONMENTAL AND FISHERIES MANAGEMENT AND CONSERVATION

Lake Inlay is a well-known tourist attraction and a destination for ecotourism because of its floating gardens, picturesque villages and diverse fauna and flora. As a result of the Moebye Dam, the lake also supplies the Lawpeta hydropower plant. The water surface of the lake was formerly 100 square miles, but then gradually declined.

The main reasons for the reduction of the water surface and the growing shallowness of the lake are erosion and siltation due to cutting of forests in the watershed, slash-and-burn cultivation methods traditionally practised in the area, vertical cultivation, steep-slope cultivation, grazing of cattle, and burning of grass on pastures.

5.1 The project *Greening and Long-Term Existence of Lake Inlay*

In order to address these problems and to preserve the lake's diverse fauna and flora, the Myanmar Government implemented the project Greening and Long-term Existence of Lake Inlay from 2000 to 2005 for the conservation of forests and the environment

within 20 miles from the borders of the lake. The following are the regulations being implemented and activities carried out:

- prohibition of the establishment of new villages on the lakeshore and construction of new floating gardens and villages in the lake;
- removal of unused floating islands and rubbish from the lake;
- ensuring of proper drainage of nine canals and dredging of silt and sand carried by the creeks into the lake; removal of water hyacinths, duck weeds and unused floating islands from the lake;
- conservation of the natural beauty and value of the lake;
- a ban on cutting trees and reclaiming of lands for cultivation within 20 miles circumference of the lake to preserve trees in the watershed area;
- promotion of sustainable forestry and cultivation through the establishment of a conservation committee by the Ministry of Forestry;
- promotion of cooperation between various government agencies and stakeholders; taking measures for the conservation of water resources, which are essential for the Lawpeta hydro-power station;
- establishment of an office for monitoring and controlling the project.

The project covered ten townships, nine of which are located in Taungyi District – Taungyi, Kalaw, Hopone, Phaekhon, Nyaungshwe, Pindaya, Yatsout and Sisaing – and one in Loikaw District – Loikaw. A supervisory committee oversaw project implementation. The Shan State Peace and Development Council was chaired by the Chairman of the Central Supervisory Committee, while the Township Supervisory Committee was chaired by the Chairman of Nyaungshwe Township Peace and Development Council. Three government agencies cooperated in the implementation of the project, i.e. the Department of Forestry, the Department of Irrigation and the Myanmar Agriculture Service. Their tasks were as follows:

- *Department of Forestry*: establishing forest reserves, community forest areas and watershed plantations; planting trees for fuelwood, encouraging mixed plantation of crops and trees, including wind-breaking trees; taking preventive measures against bank erosion; taking measures for conservation of biological diversity; and implementing all activities in close cooperation with the local community.
- *Department of Irrigation*: dredging sand and silt and remove unused floating islands and duckweeds.
- *Myanmar Agriculture Service*: constructing embankments in order to prevent siltation and erosion, cultivation of crops and distribution of crop seeds.

5.2 Present and future challenges to the environment, livelihoods, food safety and security

Notwithstanding the implementation of the project, many environmental challenges and problems remain to be addressed. Major changes of the lake are still caused by the expansion of large-scale floating gardens as large as 100-300 ha. The massive use of fertilizers and pesticides on these plots is transforming the mesotrophic and eutrophic status of the lake and the characteristics of the rooted aquatic plants and fish fauna. Currently, the common fish fauna in the lake is dominated by featherbacks, snakeheads, spiny eels, catfishes, small cyprinids, and some species indigenous to the lake. As the productivity of the lake is likely to decline due to the reduction of sunlight penetration caused by excessive blooming of phytoplankton, exotic species such as common carp and hybrid catfish may come to dominate the fish fauna. These changes may adversely affect the livelihoods of fishers, weed collectors and those servicing these groups such as net makers, fish vendors (exclusively women), boat builders and carpenters. Also, the decline of traditional fish species may have negative effects on the supply of animal protein for local communities in the vicinity of the lake. The heavy use of pesticides may pose health risks for consumers. Further, the use of massive amounts of pesticides

might adversely affect birds' eggs in the long term and the recently established bird sanctuary might lose its ecosystem. This again will have a negative impact on the evolving ecotourism.

5.3 Fisheries management

Lake Inlay has been included in the list of leaseable fisheries in Myanmar. The Shan State branch of the Department of Fisheries located in the Nyaungshwe Township, Taunggyi District, manages the Lake Inlay fishery. The Department of Fisheries issues its fishing rights and licences to the Shan State branch of the Myanmar Fisheries Federation, which in turn allocates annual fishing licences to local fishers. Fishing is practised with traditional fishing gear such as gillnets, castnets, scoopnets, long lines, traps and spears. The Myanmar Fisheries Federation currently provides fishing permits to 1 400 local fishers including those fishing in Sagar Lake, which is connected to Lake Inlay.

With a view to ensure the conservation of the fish fauna in Lake Inlay, the Shan State Department of Fisheries issues fisheries regulations that prohibit the discard of chemicals and toxicants into the lake and activities that may adversely effect water quality and the environment, and the diversity of fauna and flora in the lake and its vicinity, such as use of poison, explosives and electricity for fishing. In order to sustain the local and endemic fish species, it is prohibited to grow and introduce the pure strain of the African giant catfish. Fisheries regulations are enforced with a punishment of one-to-three month jail sentences and fines of Kyat500 to 50 000.

6. SOURCES OF MICROFINANCE FOR FISHERIES IN MYANMAR

Currently, Myanmar Economic Bank (MEB), Myanmar Agricultural Development Bank (MADB) and Myanmar Livestock and Fisheries Development Bank are the main providers of institutional credit to the agriculture sector, including the fisheries subsector. However, microfinance services are not yet extensively established. Most of the small-scale entrepreneurs including farmers and fishers do not have access to credit other than from moneylenders.

6.1 Myanmar Agricultural Development Bank (MADB)

The Myanmar Agricultural Development Bank (MADB) is a successor of the State Agriculture Bank of the Ministry of Agriculture and Irrigation. It was established over 50 years ago and now has more than 200 branches. While at present all clients are small-scale farmers borrowing funds for crop cultivation, the bank's mandate also covers the provision of financial support for production, marketing and trading, fisheries, aquaculture, sericulture, horticulture and livestock. Previously, the Central Bank of Myanmar funded MADB; now the Myanmar Economic Bank has become the source of its funds. MADB carries out the following tasks:

- advancing annual, short- and long-term loans to state-owned enterprises and organizations dealing with agriculture, livestock and fisheries, cooperative societies, private entrepreneurs, community (village) banks, farmers and labourers;
- receiving deposits for rural development, making loans and advances, and extending overdrafts with and without security;
- organizing, registering and supervising village banks, and regulating their functions and duties;
- selling bank drafts and executing telegraphic transfers, payment orders and other kinds of remittances;
- borrowing money from domestic and foreign sources to carry out the bank's functions;
- undertaking matters relating to the smooth functioning of the bank, providing and acquiring management and technical expertise, and providing consultation in support of such matters;

- performing any such business as may be approved by the Ministry of Agriculture and Irrigation.

The types of loans extended by the bank are divided into three categories – crop production loans, term loans and development loans. Seasonal crop production loans cover major crops such as paddy, groundnut, sesame, mustard, long staple cotton, jute, maize, sugar cane, and four types of beans and pulses. The loans for the livestock and fisheries sector are also included in this loan category. Term loans are extended to tea and coffee plantations, and development loans are disbursed for the purchase of water pump sets, power tillers and tractors.

Crop production loans do not require collateral other than the collective liability of borrowers. In 2003, crop production loans worth Kyat17 865.15 million were disbursed to borrowers in 224 townships. Loan repayment was sufficient for financial sustainability.

Loans disbursed to the livestock sector from 1991/1992 to 1996/1997 was worth Kyat 1 967.57 million (Table 2). Loans to the livestock and fisheries sector depend on the type of operations, as follows:

- a ten-acre carp farm over a period of two years is designated as one unit and eligible for a loan amounting to Kyat30 000;
- ten cages of carps over one year are designated as one unit and eligible for a loan amounting to Kyat20 000;
- farming of marine shrimp and freshwater prawns in newly constructed one-acre (.4 ha) earthen ponds over one year is designated as one unit and eligible for a loan of Kyat50 000;
- farming of marine shrimp and freshwater prawn in traditional ponds or in salt pans in one acre of water surface over one year is designated as one unit and eligible for a loan of Kyat10 000.

Loans are also available for integrated paddy and fish farming in inundated areas in Ayeyarwaddy and Yangon Divisions. A total of Kyat50.48 million was disbursed for this purpose from 1991 to 1998. In this case, one unit is designated as integrated paddy and fish farming on five acres for five years, and eligible for a loan of Kyat50 000 per unit.

Loans disbursed by MADB for integrated paddy and fish farming from 1991/1992 to 1997/1998 are shown in Table 3.

From 1991 to 1996, MADB provided loans for working capital expenditure of fish farmers and paddy-cum-fish farmers in the delta region, especially in the Yangon and Ayeyarwaddy Divisions. In the case of Lake Inlay, loans were disbursed for livestock and poultry breeding and farming only, and not for fisheries and fish farming. All lending to the fisheries sector was stopped after 1996 as a result of the reorganization of MADB, which became necessary when the Myanmar Livestock and Fisheries Bank was established.

MADB also mobilized savings through compulsory and voluntary savings programmes. As of June 2004, more than 1 250 000 farmers, fishers and workers had saved about Kyat6 592.09 million with MADB.

TABLE 2
Livestock loans from Myanmar Agricultural Development Bank

Financial year	Loans disbursed (Kyat million)
1991-1992	195.25
1992-1993	436.40
1993-1994	328.05
1994-1995	274.82
1995-1996	342.72
1996-1997	192.33
Total	1 967.57

Source: MADB annual report, 1998

TABLE 3
Loans for integrated paddy and fish farming, 1991/1992–1997/1998

Division	Loans disbursed (Kyat million)
Ayeyarwaddy Division	40.23
Bago Division	8.87
Yangon Division	1.38
Total	50.48

Source: MADB annual report, 1998

6.2 Myanmar Livestock and Fisheries Development Bank (MLFDB)

The Myanmar Livestock and Fisheries Development Bank (MLFDB) is a private bank, which was formed and functions within the framework of the Ministry of Livestock and Fisheries. It disburses loans to fish breeders, fish farmers, aquaculture entrepreneurs

TABLE 4
Financial support for livelihoods in the vicinity of Lake Inlay

Source	Purpose of loan	No. of borrowers	Amount Kyat million)	%
MADB	Paddy growing	2 715	52.80	5.99
MLFDB	Fishing	10	19.90	1.90
GRET	Fishing	255	9.80	0.10
GRET	Agriculture and services	8 763	955.48	92.01
	Total	11 743	1 037.98	100.00

and fishers, both inland and marine. Borrowers can be individuals as well as collective liability groups. In the case of carp farmers, the bank disburses loans of Kyat50 000 per acre for the first year of operation and increases lending up to Kyat100 000 per acre for the second year of operation. From 2001 to 2004, the bank disbursed Kyat3 168.37 million to 520 borrowers, who are raising fish and shrimp in about 21 734 acres of ponds. This includes Kyat19.80 million, which were disbursed to ten fish and shrimp farmers in the vicinity of Lake Inlay.

6.3 Loan disbursements in support of livelihoods at Lake Inlay

In addition to MLFDB and MADB, loans for fishing and fish farming were also disbursed by a private non-profit association, Groupe de Recherche et d'Échanges Technologiques (GRET), which is based in France and whose mission is to promote knowledge and understanding of methods and technologies that can support rural development, environmental conservation and urban planning.

The livelihoods of the people living at Lake Inlay are based on agriculture, fishing, traditional handicraft and provision of services such as operating and repair of fishing boats. Table 4 shows how these livelihoods were supported through the disbursement of loans from institutional sources such as MADB, MLFDB and GRET.

As seen from Table 4, the share of the fisheries sector in the total institutional lending is less than two percent. It can be assumed that presently, most credit needs of fishers and fish farmers are not met by financial institutions and NGOs, but by informal sources such as moneylenders, traders, relatives and others.

6.4 The United Nations Development Programme (UNDP) microfinance project

From 1997 to 1999, UNDP introduced microfinance projects under the second phase of its Human Development Initiatives (HDI-E) programme. Project activities were initiated in the delta region, the dry zone in Central Myanmar and in Shan State. The microfinance projects were continued during the third phase of the Human Development Initiatives programme from 1999 to 2002 in the same areas. These projects were funded by UNDP and executed by the United Nations Office for Project Services (UNOPS). The project activities were implemented by three international NGOs – the Grameen Trust from Bangladesh, in the delta region, GRET from France, in southern Shan State, and Pact[1] from the United States, in the dry zone. The Cottage Industries Department of the Ministry of Cooperatives was the counterpart government department for the project.

Currently, microfinance is provided in Myanmar under *Sustainable Microfinance to Improve the Livelihoods of the P*oor, which is one of the six projects under HDI-IV (2002-2005). The project started in 2003 and is implemented in the same manner as previous microfinance projects. The strategy of this UNDP/UNOPS project is to provide technical assistance and capital support for the three microfinance operations established under the two predecessor projects and to help them attain sustainability.

[1] Pact is an NGO that builds the capacity of local leaders and organizations to meet pressing social needs.

TABLE 5
UNDP/UNOPS-sponsored microfinance operations in Myanmar

Indicators	Dec. 1999	Dec. 2000	Dec. 2001	Dec. 2002	Dec. 2003
No. of villages covered	799	1 073	1 428	1 638	1 775
No. of borrowers	41 024	69 323	105 908	123 275	138 138
Amount of loans disbursed (Kyat1 000)	558 357	1 387 698	3 316 894	6 822 490	11 786 850
Repayment of loan principle (Kyat1 000)	328 405	903 587	2 154 960	4 795 578	8 887 057
Amount of outstanding loans (Kyat1 000)	229 852	473 810	1 208 194	2 026 912	28 899 793
Amount of savings mobilized (Kyat1 000)	20 932	52 158	138 622	319 847	590 491

Source: The Microfinance Project: Human Development Initiatives in Myanmar (UNDP/UNOPS)

In view of providing assistance to improve the necessary infrastructure and capacity for the development of microfinance institutions in Myanmar, the following strategy has been laid out.

The international technical inputs from the respective implementing foreign partners focus on institutional strengthening of microfinance operations. The day-to-day management and decision- making related to microfinance operations is under the responsibility of locally recruited staff of the subcontracted implementing partners. A newly established management board provides strategic direction and overall supervision for the respective microfinance operations.

The results of the three area-specific microfinance operations have proven that the projects have succeeded in supporting the livelihoods of poor families and have thus achieved their objectives. At the end of 2003, 138 138 poor households in 1 775 villages had benefited from the projects. A total amount of Kyat11 787 million had been disbursed as loans and Kyat590 million worth of savings had been mobilized (Table 5). The cumulative average loan repayment rate was as high as 99.5 percent.

Participatory Monitoring and Evaluation conducted in 318 villages in the project vicinity found that the project had benefited the poor by increasing their income, empowered all beneficiaries in general, and women in particular, through many types of training programmes, and contributed towards the emergence of sustainable local microfinance institutions in the area.

As far as the use of the loan funds is concerned, this was left to the borrowers and no specific statistics are available on the actual economic activities and loan purposes. Generally, it is assumed that loans were used for backyard and homestead micro-enterprises including fisheries-related activities such as fishing and fish processing.

As in other parts of Myanmar, microfinance operations at Lake Inlay commenced during the second phase of the UNDP's Human Development Initiatives (HDI-E) programme, when microfinance was introduced in Southern Shan State implemented by the GRET with UNOPS support and UNDP funding. The microfinance activities were initiated in August 1997 in collaboration with local partners, i.e. the Cottage Industries Department of the Ministry of Cooperatives, the Myanmar Agricultural and Development Bank and the Vocational Department of Technical Agriculture and Education. The project areas included five townships in southern Shan State, i.e. Kalaw, Pinlaung, Ywangan and Nyaungshwe Townships.

The third phase activities in the same area commenced in March 2000 as part of the HDI-III project, which operated from 1999 to 2002. The strategies adopted during this phase aimed to establish a locally managed microfinance institution system (MFIS) that was able to expand and sustain financial services catering to the needs of poor local households. The project aimed to reach the poor, empower women, adopt cluster approaches, promote savings habits and offer savings products, focus on small loans and to allow free loan utilization by borrowers with knowledge of other cluster or group members and agreed loan repayment schedules.

During the project period, GRET provided Kyat965.28 million to 9 018 borrowers from Nyaungshwe Township, which includes loan disbursements of Kyat9.8 million to

TABLE 6
Microfinance operations in southern Shan State, as of July 2004

Indicators	Kalaw	Pinlaung	Pindaya	Ywangan	Nyaungshwe	Total
No. of villages	119	128	85	67	206	605
No. of members	7 438	7 732	5 298	5 500	11 920	37 388
No. of borrowers	4 541	3 437	3 728	2 947	9 018	23 671
Amount of loan disbursed (million Kyat)	973.69	589.88	376.78	431.04	965.28	3 156.67
Loan outstanding (million Kyat)	173.75	128.83	112.81	111.24	314.83	841.46

Source: GRET monthly report, July 2004.

243 fishers and 12 fishery service providers on Lake Inlay. The total loan disbursement in Nyaungshwe Township alone by GRET was Kyat965.28 million.

There were 11 920 persons from 206 villages who received microfinance from GRET in Nyaungshwe Township. Table 6 gives an overview of the microfinance operations in 5 townships in southern Shan State. As of July 2004, Kyat3156 .67 million had been disbursed to 23 671 borrowers in 605 villages.

Of the total loan disbursement, 79 percent was used for agriculture, 19.98 percent for handicrafts and trading, and 1.02 percent for fishery purposes.

6.5 Participation of social welfare organizations and NGOs in microfinance programmes

NGOs such as Save the Children and World Vision, and social welfare organizations such as the Myanmar Women Affairs Federation (MWAF), the Myanmar Women Entrepreneurial Association (MWEA) and the Myanmar Maternal and Child Welfare Association (MMCWA), also participate in microfinance schemes for the rural poor.

The Myanmar Women Affairs Federation (MWAF)

The object of the MWAF is to promote the advancement of women and to ensure their full participation in national development programmes. More specifically, MWAF promotes technology transfer to women and provides access to employment for women in order to enhance income generation in poor families. The Federation also disburses loans to families with low income.

In 2004, MWAF in Nyaungshwe Township on Lake Inlay provided Kyat8.5 million in microcredit without collateral to poor rural women for agricultural activities, starting grocery shops, and making and selling handicraft. Individual loan amounts were around Kyat20 000 per woman.

The *Myanmar Women Entrepreneurial Association (MWEA)*

The overall aim of the Association is to strengthen the economic and social role of women in Myanmar as well as in the regional and global economy and society. This is to be achieved through improved communication and coordination among women in the country through the dissemination of information on modern economic management practices. Further, networking among intellectuals in Myanmar and abroad will be promoted – among professional, academic and economic organizations and associations – by organizing and participating in conferences, seminars, workshops, information exchange via internet and other means. MWEA also promotes the participation of women in Myanmar in poverty alleviation efforts.

A special emphasis is placed on improving the livelihoods of poor women by generating income and employment. MWEA disburses loans without collateral to female vendors as well as to women whose livelihoods depend on sewing, weaving, breeding and raising livestock. The interest charged on the loans is used to build capital for the newly formed women's associations. These associations are encouraged to promote savings among their members, which can be used for further lending and capital build-up.

The Myanmar Maternal and Child Welfare Association (MMCWA)

The Myanmar Maternal and Child Welfare Association (MMCWA) is a voluntary humanitarian organization that aims to provide health care for mothers and children throughout the country and raise their quality of life as well as to provide support to other social welfare organizations. MMCWA also supports the generation of additional family income through the provision of small loans to invest in micro-enterprises such as pig and poultry farming, gardening and growing vegetables. In 2004, MMCWA disbursed Kyat8.5 million in various states of Myanmar including Southern Shan State.

7. CONCLUSIONS AND RECOMMENDATIONS

As shown above, many promising initiatives are under way in Myanmar to conserve and sustainably manage the environment and aquatic and other natural resources in the vicinity of Lake Inlay. Similarly, efforts have increased in Myanmar to alleviate poverty and to improve the livelihoods of the poor and other rural dwellers living in the vicinity of the lake. Microfinance programmes have played an important role in these efforts.

In spite of these efforts and the progress made, only a minority of fishers and their families living in the vicinity of the lake have gained access to institutional sources of credit, and the majority still depend on informal sources of credit. The issue of credit and microfinance support to the conservation and rehabilitation of the natural environment of Lake Inlay and its ecosystem has not yet received the attention it deserves.

In order to expand rural microfinance in Myanmar in general, and for the fisheries sector and other relevant stakeholders at Lake Inlay in particular, it is recommended that:

- Myanmar Agricultural Development Bank (MADB) and Myanmar Livestock and Fisheries Development Bank (MLFDB) set up a microfinance services programme in rural areas to support livelihoods of people managing backyard, household and other micro-enterprises and small-scale services, including those in the inland fisheries sector.
- MADB and MLFDB provide three-to-five year term loans to be independently managed by a committee for income generation, services provision, agricultural crop production, livestock breeding and fisheries-related activities, with a view to support capital investment in rural development.

Existing microcredit projects such as the one implemented by GRET have demonstrated the success of small-scale financial services. The experiences acquired and lessons learned should be disseminated through MADB and MLFDB, which should continue the provision of microfinance and rural credit after the projects have ended.

Finally, all microfinance activities and initiatives, including those in inland fisheries, should emphasize long-term sustainability as a goal. This requires the careful consideration of the financial and credit needs related to the rehabilitation and conservation of ecosystems and the natural environment through measures such as habitat and other improvements. This is particularly relevant for inland fisheries, where the various uses of a lake such as Lake Inlay for fisheries, ecotourism, supply of water for drinking and irrigation and many other uses crucially depend on the health and conservation of its natural environment.

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VI. Increasing inland fisheries production and livelihood security in Cambodia through fishery policy reform and aquaculture development – prospects and constraints

By Heng Sotharith

1. INTRODUCTION

Cambodia's inland capture fisheries, based on the Mekong River and its tributaries and floodplains, are among the most productive and species-rich freshwater fisheries in the world. The freshwater fishery resources of the country have been exploited for many centuries. The Mekong River system continues to provide its natural bounty of fish and other aquatic animals because it still contains large areas of natural habitat and is relatively undisturbed by dams and industrial activities that would alter hydrology and water quality. The system's high productivity is based on a complex floodplain system, which is nurtured by the annual monsoon that causes a single large flood lasting for several months between May and November. About 85 to 90 percent of the discharge is generated during the rainy season. At Krati, the Mekong's maximum discharge is about 50 times its minimum.

In Cambodia, about 20 000 to 25 000 km^2 of land is flooded every year. The extent of flooding depends on the strength of the monsoon. The Tonle Sap Great Lake floodplains in the heart of the country contain the largest continuous areas of natural wetland habitats remaining in the Mekong system. The Tonle Sap Great Lake is the largest permanent freshwater body in Southeast Asia. The lake is connected to the Mekong River by the Tonle Sap River. Due to higher water levels in the Mekong River during most of the rainy season, the Tonle Sap River flows towards the lake, thereby enlarging it three- to six-fold, from 2 700 km^2 to between 9 000 and 16 000 km^2. During the dry season, the Mekong River's water level falls so that the flow of the Tonle Sap River reverses and the water flows back towards the Mekong River.

The basic diet of Cambodians consists of rice and fish. Fish accounts for 70 percent of the animal protein intake of Cambodians, especially of the rural poor. Fish consumption of rural dwellers living in the floodplain around the Tonle Sap Great Lake is estimated at 75.6 kg per person per year, while those living in fish-deficit areas such as Prey Veng and Svay Rieng Province consume from 22 to 40 kg/person/year (Gregory, 1997). The national average fish consumption is in the range of 30 to 40 kg/person/year.

While fish plays a major role, not only in the diet, but also in the economy of the Cambodian people, the lack of reliable statistics, particularly for small-scale fisheries and aquaculture, has resulted in ignoring the important contribution of capture fisheries to the livelihoods of the poor. On the other hand, aquaculture is widely seen as the principal opportunity to fill the demand-supply gap, especially in those areas that

are remote from the main water bodies exploited by capture fisheries. It also serves as an opportunity to reduce the pressure on fishery resources from capture fisheries.

2. STATUS AND TRENDS OF INLAND FISHERIES

About 80 percent of Cambodia's land area is located within the Mekong River catchment area, which accounts for about 20 percent of the total catchment area. Several small rivers, which flow to the sea in southwest Cambodia, do not have extensive floodplains and are relatively unproductive as far as fisheries are concerned.

Cambodia is rich in water resources and varieties of fish habitats. The Mekong, Tonle Sap and Basac Rivers and many of their tributaries, numerous lakes, and the Tonle Sap Great Lake and its floodplains comprise a wide range of different habitat types from marshes, swamps, shrublands, grasslands and flooded forests to rice fields. After rice fields, flooded forests account for the second largest land use area of Cambodia and have a huge potential for fish production. The availability of habitat is influenced by the flood regime of the Mekong River, which expand and contract the floodplains of Tonle Sap Great Lake. The centre of the Tonle Sap Great Lake consists largely of open water that serves as an important refuge for fish in the dry season when the lateral zone dries up. Fish production in the Tonle Sap Great Lake is about 139 to 190 kg/ha/year (Lieng and Van Zalinge, 2001).

The large floodplains and extensive wetland areas surrounding the Tonle Sap Great Lake are both highly valuable and vulnerable. High biodiversity and biological productivity allow these areas to offer habitat to a broad variety of aquatic life. More than 500 fish species have been identified in the Mekong River area (Rainboth, 1996). In the past, Cambodia was covered with thick forests, which protected the catchment areas of rivers, thus regulating their hydrology and providing fish with its habitat, including floodplains. During the 1950s and 1960s, forests still covered about 70 percent of Cambodia's land mass. By 1997, this figure had officially declined to about 60 percent. Much of this allegedly remaining forest cover, however, had actually been converted to agriculture, or consisted of secondary and tertiary growth, since many of the old trees had been cut.

Clearing of forests has accelerated in recent years, and with the disappearance of flooded forest lands, particularly near heavily populated areas, an important fish habitat has been lost. While the loss of forest cover in Cambodia as well as in upstream countries caused a wide range of negative impacts on hydrological and aquatic ecological systems, the actual extent of these losses and their impacts have not been accurately documented.

The annual landing site value of Cambodia's inland fish production in 1998 has been estimated between US$150 to 250 million (Van Zalinge, Nao and Deap, 1999). According to estimations of the market value of fish production in the lower Mekong River Basin, the freshwater capture fishery of Cambodia has a market value of more than US$300 million. The Department of Fisheries generated revenues worth US$1.9 million in 1998 (DoF, 1999).

As shown in Table 1, from 2000 to 2005, the annual fish production fluctuated considerably from year to year; it was highest in 2001. In 2005, 410 000 tonnes of fish were harvested, of which 79 percent was contributed by inland capture fisheries and only 6 percent by aquaculture. Some observers consider recent catch statistics as too low and underestimated due to weaknesses in the system of collecting catch statistics at fish landing sites.

3. SOCIO-ECONOMIC IMPORTANCE OF INLAND FISHERIES

According to the Cambodian fisheries law, small-scale fisheries and family-based fisheries are classified as subsistence fisheries, which can be carried out during the entire year in open-access water areas but not in fishing lots. Fishing lots are units of

TABLE 1
Cambodia's capture fisheries and aquaculture production, 2000–2005, in tonnes

Year	Inland	Marine	Aquaculture	Total
2000	245 600	36 000	14 430	296 030
2001	385 000	42 000	17 500	441 000
2002	360 300	45 850	18 200	420 750
2003	308 750	54 750	18 500	382 000
2004	250 000	55 800	18 650	324 460
2005	324 000	60 000	25 900	410 000

Source: Department of Fisheries of Cambodia, 2005.

water bodies that can be leased. Small-scale fishers use all kinds of small-size fishing gears, which can be operated by one or two persons, such as gillnets, castnets, scoop nets, shrimp scoop nets, hand pushnets, small bamboo traps, hook and lines, spears and other fishing gear (Tana, 2002).

Rural farmers and rural poor are involved in subsistence fisheries in rice fields. Fisheries-related employment is very important for rural livelihoods. A study on rice field fisheries found these fisheries to be of socio-economic importance for the rural poor in the rural Svay Rieng Province. A household survey of fishing dependent communes in 1995 conducted in eight provinces around Tonle Sap Great Lake and the southern floodplains with the total population of 2.4 million people and 453 000 households indicated that for 10.5 percent of these households, fishing or fisheries-related activities such as fish marketing was their primary occupation and source of income, while another 34.1 percent of households were engaged part-time in fishing or fisheries-related activities (Ahmed *et al*., 1998).

Of the households engaged in fishing or fisheries-related activities, 87 percent were involved in small-scale, family-based fishing or fisheries-related activities, 9 percent in medium-scale fishing or fisheries-related activities, and only 4 percent in large-scale activities (Ahmed *et al*., 1998). The study also found that small-scale, family-based fisheries are often carried out in rice fields or nearby water bodies such as canals, swamps or small lakes. The average annual catch per household involved in small- and medium-scale fishing was 647 kg and 3 319 kg, respectively. Nearly 40 percent of the catch was consumed by the fishers and their families, and 60 percent was sold for cash. Through fishing and other income-generating activities, the households surveyed had a cash income of around US$380 per year (Ahmed *et al*., 1998).

From 1994 to 1998, the project *Management of Freshwater Captures Fisheries of Cambodia*, implemented by the Mekong River Commission (MRC), Danish International Development Agency (DANIDA) and the Department of Fisheries of Cambodia (DoF) established a system of fishery data collection based on stratified sampling by species, fishing gear and district and on a survey of fishing gear (Diep, Ly and Van Zalinge, 1998). Table 2 shows the ranges of annual catches from 1994 to 1997, separately for large-scale, medium-scale, small-scale and rice field fisheries. As in the case of the total fish production from 2000 to 2005, shown in Table 1, the catch ranges shown in Table 2 indicate considerable catch fluctuations, which are particularly pronounced in the case of large-scale and rice field fisheries, while the catch ranges of small-scale and medium-scale fisheries show smaller annual fluctuations.

TABLE 2
Range of annual inland fish catches, 1994–1997

Type of fisheries	Annual catch ranges (tonnes)
Large-scale fisheries:	
- Fishing lots	25 000 – 75 000
- dais (bag nets)	10 000 – 20 000
Medium-scale fisheries	85 000 – 100 000
Small-scale family-based fisheries	115 000 – 140 000
Rice field fisheries	45 000 – 110 000
Total	280 000 – 445 000

Sources: Ahmed *et al*., 1998; Diep, Ly and Van Zalinge, 1998.

In the case of large-scale fishing operations in fishing lots, the wide range of the annual catch from 25 000 to 75 000 tonnes reflects the uncertainty of catch levels. In the case of rice field fisheries, the yield ranges from 25 to 62 kg/ha.

Large-scale inland fisheries, i.e. the fishing lots and *dai* (or bag net) fisheries are confined to limited areas and managed as government concessions. The system originated during the French Colonial period. Because of conflicts between managers of fishing lots and local fishing communities, the area of fishing lots that can be leased for large-scale fishing operations was gradually reduced. The largest reduction took place in 2001.

As far as the economic role of fisheries is concerned, many other industries depend on Cambodia's fisheries sector: manufacturers of fishing gear, fishing boats, suppliers of fuel, ice and preservatives, workers in transportation and marketing, as well as other downstream industries. Better information on the economic contribution of these industries and the employment they provide is urgently needed. Current conservative estimates assess the contribution of the fishery industry to Cambodia's GDP as 12 percent, ahead of rice production, which accounts for ten percent of the country's GDP. Considering the weakness of fishery statistics in Cambodia, the actual contribution of fisheries to the GDP of the country might even be higher than 12 percent.

4. FISHERIES POLICY REFORM

Fishery resources management and development in Cambodia aims to improve rural livelihoods and food security through enhancing the sustainable use of fishery resources and the access of the rural poor to these resources. In 2002, the government declared 1 July as National Fish Day to encourage people to participate in fisheries conservation and development and to ensure the long-term, sustainable use of fishery resources – social, economic and environmental.

To achieve this goal, the Government of Cambodia changed its fisheries policy and delegated the authority for fishery resources management to local communities. In June 2005, the government passed a new subdecree on community fisheries to facilitate the establishment and organization of community fisheries. The reform also abolished the taxation of medium-scale fishing operations. About 56 percent of all previously leased and commercially fished fishing lots were abolished and placed under a community fisheries management regime. Table 3 shows the number of fishing lots that existed before and after the fishery policy reform. The lots to which small-scale fishing communities were granted access were mainly situated in rivers, lakes and streams.

To date, 404 community fisheries have been established by the Department of Fisheries in collaboration with local governments and NGOs. Most of the members and leaders of the newly established community fisheries still lack the necessary skills and knowledge to manage their community fisheries. The situation is further aggravated by the fact that apart from the subdecree on community fisheries, no appropriate laws and regulatory frameworks have yet been adopted that could govern and guide the functioning of the newly established community fisheries.

The new political platform of the Royal Government of Cambodia of the third legislature pertaining to natural resource management clearly states that the fisheries sector reform will be accompanied by scientific research and the conversion of some

TABLE 3
Number of fishing lots remaining after the fishery policy reform

Fishing lots	Prior to reform	Abolished	Remaining after reform
Lake and stream lots	135	54	81
Bag net lots (dai fishing)	63	3	60
White Lady bag net lots	8	0	08
Prawn bag net	13	0	13
Riverine lots	20	20	0
Total	239	77	162

Source: Nao Thuok, 2001.

of the fishing lots to fish sanctuaries to enhance fish stocks and conserve endangered species. As part of the new fisheries policy, the number of community managed fishing lots will be increased and the development of aquaculture will be promoted to respond to an increasing demand for fish and to reduce the pressure on fishery resources exerted by capture fisheries.

The Fisheries Management and Development Plan of Cambodia aims to:

- ensure the sustainable management and utilization of the fishery resources to secure food for the people and to alleviate poverty;
- promote and encourage aquaculture development in every way, particularly small-scale aquaculture in rural areas in order to supply protein and to supplement existing levels and forms of fish production;
- promote community fisheries and local participation in fisheries management and to secure sustainable livelihoods for farmers in terms of social, economic and nutritional benefits;
- protect and conserve critical habitats and restore endangered species;
- provide quality services to all clients and training for fisheries staff to better understand the concerns of the fishery industry;
- promote fisheries extension work at all levels;
- encourage investments in the fisheries sector and improve the basic infrastructure for fisheries development, particularly for post-harvest handling and processing.

5. CONSTRAINTS TO SUSTAINABLE FISHERIES DEVELOPMENT AND TO THE REHABILITATION OF THE ENVIRONMENT

Fishing villages are often affected by both flooding and receding waters. This is particularly true for the floating villages in Tonle Sap Great Lake, which have to shift their position on the lake seasonally according to the movement of the water level. There is a lack of social organizations in fishing communities such as fisher associations, clubs or cooperatives, which makes it difficult to manage fishery resources at the community level. Work crews in small-scale fisheries in Cambodia usually consist of family members and relatives. Kin group-based work crews also play an important role in the exploitation of fishing lots, either through contractual agreements with lot owners, as subleasors or sometimes as poachers.

Small-scale fisheries also suffer from the degradation of fish habitat. The increasing use of water for irrigation and deterioration of water quality through pollution caused by industrialization and urbanization have negative affects on biodiversity and on the abundance of aquatic resources. Flood controls reduce the expansion of floodplains and the breeding and reproduction of fish, particularly of migratory species (Van Zalinge *et al.*, 2000).

The construction of dams and barriers causes disturbance, changing the physical shape of water bodies and obstructing fish migration. The negative consequences of deforestation, the inflow of nutrients from agricultural activities close to water bodies, road construction, hydropower plants and other forms of development for water quality, fishery resources and habitat are already evident. The major concern is the loss of riparian vegetation cover and the rapid loss of flooded forests, which provide crucial aquatic habitat for fishes.

The catch rate per fisher has declined because the increase in population and in the number of fishers has outstripped the increase in catch (Van Zalinge *et al.*, 2000). If fishing pressure were to increase further, it would probably not lead to a further increase in the total catch but to a further decline of the catch rate per fisher. Table 4 shows changes in population and catch between 1940 and 1995/1996 in the Tonle Sap Great Lake region.

The decline of the catch rate of small-scale fishers leads to conflicts between small and large-scale fishers. Large-scale fishers usually exploit fishing lots located in the

TABLE 4
Changes in population size and fish catch in the Tonle Sap Lake region, 1940–1995/1996

Period	Population (million)	No. of fishers (million)	Increase in population	Tonle Sap Great Lake fish production (tonnes)	Increase in fish catch	Annual fish catch per fisher (kg)	Decline in catch per fisher
1940	3.2	0.36		125 000		347	
1996	10.7	1.20	3.3 x	235 000	1.9 x	196	-44%

Sources: Chevey and Le Poulain, 1940; MRC and DoF.

productive and rich fishing grounds in flooded forests. Because of the rapid increase in number of fishers and limited fishing grounds, small-scale fishers started to poach fish in the productive fishing grounds of fishing lots that had been leased by large-scale operators. The fishing lot operators used armed guards to protect their lots. Small-scale fishers often complained that the large-scale operators themselves did not observe their lot boundaries and also fished in the open access areas exploited by small-scale fishers. After the fishery sector policy reform, conflicts are still occurring in some areas, but the scale and number of conflicts have been greatly reduced.

The practice of illegal fishing leads to conflicts as some people gain an advantage over others by breaking the law and causing a serious decline of spawning fish. The use of explosives, especially in the deep channels of the upper Mekong in Kratie and Stung Treng Provinces, is particularly destructive as it targets spawning populations seeking shelter in these channels during the dry season (Van Zalinge *et al.*, 2000). This type of illegal fishing is done mainly by fishers under armed protection, but also by villagers on their own initiative. The decline in the number of spawning fish resulted in a decline in fish productivity, particularly of large species that require several years to reach maturity.

Environmental risks and degradation of the natural resource base are an important threat to aquaculture development and fisheries. Aquaculture is affected by natural disasters, aquatic animal diseases, introduction of exotic species, loss of genetic diversity through poor genetic resource management strategies, and by water pollution.

6. POTENTIAL AND RISKS OF AQUACULTURE DEVELOPMENT

Aquaculture in Cambodia is practised in the form of pond, cage or pen culture and is distinguished according to the scale of operation as small-, medium- and large-scale aquaculture. Small-scale pond culture is defined by a pond size not exceeding 100 m² and an annual production of 30 to 50 kg, which is mainly used for household consumption. Medium-scale aquaculture is carried out in ponds from 100 m² to 1 ha; the fish produced is sold for cash; and the annual sales revenue is about US$5 000. Large-scale pond culture uses a pond area of more than one hectare.

There are currently 4 942 cages used for fish culture. Cage culture has been practised in Cambodia for more than a century and is still the major form of inland aquaculture (Nandeesha, 2002). Pens were first used to stock fish of non-marketable size caught in fishing lots for fattening throughout the dry season. The fish was then transferred to floating cages, when floodwater rose high enough during the rainy season to float the cages downstream to markets (Tana, 2002).

There are also about 160 pens in Cambodia used for growing fish. Fishers in the Tonle Sap Great Lake first stored the surplus of their catch in bamboo pens or floating cages and kept them alive by feeding. Later, they stocked smaller fish in cages to fatten and sell them during the off-season. The preferred species for cage culture are giant snakehead *(Channa micropeltes)* and river catfish *(Pangasianodon hypophthalmus)*, although the latter species is no longer profitable. The production of cultured *Pangasianodon hypophthalmus* and *Channa micropeltes* in both ponds and cages has been steadily declining, due to a shortage of wild seed supply and of trash fish for feeding, and the deterioration of water quality, which caused the outbreak of fish diseases and killed large quantities of cultured fish.

TABLE 5
Aquaculture production, 2000 to 2005

Year	Production (tonnes)				
	Fish	Shrimp	Seaweed	Fish fingerlings (in 1 000s)	Crocodiles (heads)
2000	14 410	20		7 508	26 300
2001	13 857	143	3 500	11 000	36 000
2002	14 547	53	3 650	13 293	50 850
2003	18 410	90	7 800	14 293	78 008
2004	18 585	75	16 840	15 793	150 372
2005	25 890	110	18 000	18 733	120 000

Source: Department of Fisheries, 2002.

Pond culture in Cambodia is of recent origin and started in the 1960s. There are presently 44 581 fish ponds in Cambodia. Pond culture of Chinese carps and tilapia was attempted around Phnom Penh and in some plantations and garden ponds. Aquaculture development in Cambodia is very slow both in terms of technology advances and production increases, probably because of the reliable and relatively inexpensive fish supply from capture fisheries.

Today, aquaculture in Cambodia contributes 6 percent to the total fish production. From 1993 to 1998, aquaculture production in Cambodia increased annually by 15 to 20 percent. Table 5 shows the production increases from 2000 to 2005. It is estimated that the share of aquaculture in the total fish production will continue to increase in the coming years.

Coastal aquaculture is a relatively new development in Cambodia. It started in 1989 with the setting up of several shrimp and fish farms. It has significantly expanded since 1991, but has not yet reached the same production levels as inland aquaculture. A future expansion is expected, however, because of the high value of shrimp and fish that can be farmed and their potential to generate foreign exchange earnings through exports. A major setback occurred because of problems associated with disease, which forced many farms to close. The present production of coastal aquaculture is only 60 tonnes per year.

As capture fishery production is stagnating or even declining and the population and the demand for fish is increasing, the Government of Cambodia, in collaboration with a number of NGOS, international organizations and donors, promotes small-scale aquaculture development in different parts of the country. This activity is helping farmers in rural areas to grow fish both for family consumption and cash income generation.

In order to maintain a balance between fish demand and supply in 2010, when the Cambodian population is expected to have increased to 16 million people, the total fish supply, both from the wild and aquaculture, should be 586 000 tonnes, for a 35 to 40 kg/year/capita consumption. In order to achieve this target, the government expects the aquaculture sector to supply about 222 000 tonnes of fish annually.

Aquaculture development, particularly in rural areas, is expected to increase the availability of fish and thus contribute to food security and safety, improve household income through the sale of fish, enhance social status, make better use of natural resources, and provide employment for women.

Lessons learned from aquaculture development pilot projects in Cambodia, however, also indicate many possible negative effects and constraints. The main constraints faced by NGOs, international organizations and projects are the lack of financial resources, facilities and manpower. Constraints faced by farmers willing to take up fish farming are the lack of capital for pond and cage construction, of access to credit with reasonable interest rates, and of availability of seed of good quality, as

well as seasonal scarcity of water for pond culture, natural hazards such as flooding or drought, a lack of extension services support and the limited amount of land suitable for pond culture.

Aquaculture of highly carnivorous species such as snakehead fish *(Channa micropeltes* and *Channa Striata)* also causes problems for fishery resources. Farmers of these species usually catch juvenile fish to feed snakehead, even during the closed season from June to October when fish is spawning, a practice that contributes to an unsustainable utilization of fishery resources and eventually leads to a decline of wild fish stocks and their productivity.

7. ACCESS TO CREDIT AND MICROFINANCE SERVICES

With few exceptions, small-scale fishers and fish farmers in Cambodia do not have access to rural credit and microfinance services. This was one of the findings of a national conference organized with the support of APRACA and FAO in 2004 in Phnom Penh. The conference was a first step in initiating a dialogue between representatives of community fisheries, microfinance institutions and government agencies to explore how microfinance institutions, many of them recently established, can cater to the needs of community fisheries and other stakeholders in the fisheries sector.

As a result of the workshop discussions, it was found that because of their poverty, small-scale fishers and fish farmers cannot afford to invest in responsible fishing gear to make full and sustainable use and to fully benefit from the fishing lots made available to them by fishery policy reform.

Similarly, community fisheries do not have the financial resources to invest in the rehabilitation of the aquatic environment, which is under their management authority, or to take up aquaculture or fisheries related-activities such as fish processing and marketing that might increase their income and improve their livelihoods. Small-scale fishers and fish farmers in Cambodia still depend on moneylenders and traders for their credit needs. The unfavourable terms and conditions attached to credit provided by the informal sector prevent fishers from getting out of poverty.

Without access to microfinance and rural credit for small-scale fishers and fish farmers, the fishery policy reform in Cambodia and the plans for introduction of sustainable fishing and fish farming practices and the rehabilitation and conservation of the aquatic environment will have great difficulties in achieving their objectives.

8. RECOMMENDATIONS

To resolve the problems facing the future of the inland fisheries sector in Cambodia, there is a need for strengthening capacities of fisheries officers, members of community fisheries and the microfinance sector. Capacity building should include education and training as well as research and extension services to support the implementation of fisheries laws, policies and regulations.

There is a need to mobilize funds for community fisheries development from microfinance, rural financial institutions and the government. There is also a need for economic and other incentives to foster aquaculture development.

Existing rules and regulations for providing credit and microfinance and lending policies should be reviewed and, if necessary, changed so that they support the creation of employment at the community level in fishing, fish farming, fish processing and marketing, manufacture of fishing gears and similar activities.

There is a need for better understanding and promotion of the financial needs of fisheries and aquaculture among financial institutions and bi- and multilateral assistance agencies, and for credit schemes supporting sustainable aquaculture development, including microfinance programmes for small-scale aquaculture development. Further, there is need to establish an aquaculture extension network as well as collaboration between research institutions dealing with inland aquaculture development and

education, including feed and feeding technology, at the provincial, national and regional level.

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VII. Successful involvement of local communities in conservation programmes for Malayan mahseer in River Kinabatangan of Sabah

By Mahyam Mohd. Isa and Jephrin Wong

1. INTRODUCTION

Sabah is popularly known as the "land below the wind". It is the second largest state in Malaysia, with an estimated land area of 73 711 km² and a coastline of 1 600 km, with a population of approximately 2.6 million. It is an agricultural state: over 70 percent of the population live in rural areas and most are directly or indirectly dependent on agriculture, livestock and fisheries for their livelihoods. These sectors contribute significantly to the export earnings of the state, which is becoming a net exporter of fish products. While the economy of Sabah consists mainly of export-oriented sectors, the state has recently embarked on more resource-based diversification and value-addition.

Development programmes have been tailored to offer opportunities and assistance to further develop the fisheries sector. The prospects for the fisheries sector in Sabah have been widely recognized due to its vast resources of rich and diverse aquatic and marine life. The fisheries sector is a significant industry and an essential element of ensuring continuity in the development and growth of the food-producing sector of the economy.

Freshwater fish is an important source of protein for the rural communities in the interior regions of Sabah. Before the 1960s, fish could be easily obtained from inland rivers throughout the state. But the development of the timber industry and extensive agricultural development have resulted in soil erosion, pollution and consequent destruction of fish breeding grounds and habitats, especially in the east coast region where most of the oil palm plantations are located. Caused by overfishing of rivers, the population of freshwater fishes in the state has dwindled rapidly over the years. The state government and the Fisheries Department have recognized the urgency to address the problems concerning the decline of freshwater fishes and have taken steps to assist the affected rural communities by introducing freshwater fish farming and encouraging rural communities to restore riverine fishery resources through community-based fishery resources management.

The paper highlights some of the work carried out by local communities in conserving and restoring one of the endangered freshwater species at River Kinabatangan, Sabah through a community-based fishery resources management system, locally called *Tagal*. The paper describes how the *Tagal* system works, its present status in Sabah, strategies to make it sustainable, as well as the roles played by the Sabah Fisheries Department and its future plan to promote ecotourism and sport fishing to generate new income for rural communities with the help of micro-credit support.

2. DESCRIPTION OF SABAH

2.1 Geographic location

The Malaysian State of Sabah is situated in the northeastern part of Borneo Island bordered by Brunei and the Malaysian State of Sarawak in the southwest and

Indonesian Kalimantan in the south. It has a large coastal area and is surrounded by the South China Sea and the Palawan Thrust in the northwest, the Celebes Sea in the southeast, and the Sulu Sea in the east.

Sabah covers a wide and diverse physiographical range and a wide range of aquatic and terrestrial habitats. Aquatic habitats range from fast-flowing mountain streams to the extensive tracts of floodplains in the northeast of the state. Coastal habitats are diverse, including nipah and mangrove swamps, estuarine areas, rocky shores, sandy beaches, coastal islands and the open sea. The west coast is generally more rocky and sandy, while mangrove swamps dominate the east coast.

2.2 Climate

Sabah experiences a typical equatorial climate with temperatures between 27 to 34 °C, a considerable amount of rain (1 800 to 4 000 mm/year) and high humidity. The two prevailing monsoons in Sabah that characterize the climate in this region are the northeast monsoon and the southwest monsoon. The northeast monsoon prevails from November to March, while the southwest monsoon prevails from May to September. There are also two successive inter-monsoon seasons: April to May, and September to October. While the coastal areas experience occasionally severe storms, the entire state is situated below the typhoon belt.

2.3 Water resources

Water resources in the state are grouped into three main categories to include surface water, groundwater, and marine and estuarine water. Surface water is one of the major sources of freshwater supply in Sabah. Surface water sources are streams and rivers that flow into lakes, wetlands, watersheds and man-made reservoirs. The supply of surface water is renewable as long as there is enough precipitation. In Sabah, much of the surface water supply comes from major rivers. There are 19 river basins in Sabah, with the largest being the Kinabatangan River basin on the east coast, covering an area of 15 385 km^2. The Padas River on the west coast covers an area of 8 726 km^2. Most of the other basins cover smaller areas.

The groundwater supply is largely dependent on rainfall for recharge. It has been estimated that about 22 percent of the annual rainfall percolates into the bedrock and is utilized as groundwater recharge. The percolation rates may vary depending on the porosity of the soil. Groundwater can easily be depleted during dry periods or in areas where soil is impervious to water. Presently, the groundwater supply in Sabah is largely used as a supplementary supply.

The marine ecosystem is divided into the estuarine zone and the oceanic zone. The estuarine zone represents less than ten percent of the total ocean area, but contains 90 percent of all marine life. The oceanic zone represents 90 percent of the total ocean area, but supports only a little marine life. The water in the estuarine zone is shallow and therefore allows sunlight penetration for photosynthesis to occur in the vast population of phytoplankton, which supports the marine life.

3. THE FISHERIES SECTOR

The fisheries sector of Sabah is divided into four subsectors – marine capture fisheries, marine aquaculture, inland capture fisheries, and freshwater aquaculture.

The economic contribution of these subsectors to the state is shown in Table 1. Of the four subsectors, the marine capture fisheries show the highest economic contribution, while inland capture fisheries show the lowest.

In 2003, inland capture fisheries contributed less than one percent to Sabah's gross fishery production. However, inland fisheries play an important role in the socio-economic conditions of the rural people through employment generation, income and as a source of protein. The demand for freshwater fish – an important source of animal

TABLE 1
Economic contribution of Sabah fisheries sector, 2003

Fisheries sector	Production (tonnes)	Production (%)	Wholesale value (RM million)	Value (%)
Marine capture fisheries	160 269.28	93.15	495.402	74.21
Marine aquaculture	3 372.66	1.96	93.446	14.00
Seaweed culture	2 760.80	1.60	5.385	0.81
Freshwater aquaculture	5 572.57	3.24	72.443	10.85
Inland capture fisheries	78.08	0.05	0.859	0.13
Total	172 053.39		667.534	

Source: Sabah Annual Fisheries Statistics.

protein for rural communities – has always been high in the rural interior regions of Sabah, because marine fish is not easily available in these regions due to poor accessibility.

3.1 Inland water resources

The inland water resources of Sabah can be divided into two categories: open inland waters (rivers and streams) and closed water bodies, i.e. oxbow and man-made lakes.

Open inland waters

The total area of open inland waters is estimated at 34 321 ha, which account for 97.5 percent of the total area of freshwater in Sabah. The open water resources contribute significantly to fish production by providing waters for aquaculture farms and capture fisheries. There are 16 major rivers, as shown in Table 2.

TABLE 2
Major rivers of Sabah State

Name of rivers	Districts
Sg. Bengkoka	Kudat
Sg. Kadamaian	Kota Belud
Sg. Wario	Kota Belud
Sg. Segama	Lahad Datu
Sg. Sugut	Beluran
Sg. Kinabatangan	Kinabatangan
Sg. Papar	Papar
Sg. Padas	Beaufort
Sg. Membakut / Mawao	Membakut
Sg. Mesapol	Sipitang
Sg. Nabawan	Nabawan
Sg. Kalumpang	Kunak
Sg. Babagon	Penampang
Sg. Pensiangan	Pensiangan
Sg. Kiulu	Tamparuli/Tuaran
Sg. Tamparuli	Tamparuli/Tuaran

Closed water bodies

This category of inland water refers to bodies of water with minimal or no connection to rivers or open water systems under normal conditions; it consists of man-made lakes and oxbow lakes. Young meandering rivers tend to straighten their course over long time periods separating previously bent portions from the main river's course and flow of water. Generally, these bends are horseshoe- or ox yoke-shaped, and such water bodies separating themselves from the rivers are called oxbow lakes. There are several oxbow lakes in Sabah, namely Kota Marudu, Kinabatangan, Beaufort, Kota Belud and Tenom. The total area of oxbow and man-made lakes in Sabah is estimated at about 891 ha and accounts for 2.5 percent of the total area of freshwater bodies in the state. These lakes have vast potential for the development of aquaculture with floating cages, pen culture and freshwater ranching.

3.2 Inland capture fisheries

Inland capture fisheries in Sabah are mainly carried out in rivers and rarely in lakes, reservoirs and floodplains. The major inland water bodies in Sabah are shown in Table 3. Kinabatangan River is the largest and the longest river in Sabah with a total length of more than 560 km.

As mentioned above, although the production of fish from inland fisheries contributes only one percent of the total fish production, it still plays an important socio-economic role for rural people through the generation of employment and income and as a source of protein. The demand for freshwater fish has always been high in rural areas. In many of the villages along the Kinabatangan River and Segama River, the livelihoods of the villagers greatly depend on their income from the catches

TABLE 3
Major inland water bodies of Sabah contributing to the landings of inland capture fisheries

Type of inland water bodies	Drain into
Kinabatangan River	Sulu Sea
Padas River	South China Sea
Labuk River	Sulu Sea
Segama River	Sulu Sea
Kalabakan River	Celebes Sea
Paitan River	Sulu Sea
Sugut River	Sulu Sea
Oxbow Lake, Kinabatangan	

TABLE 4
Quantity and value of freshwater fish landed in Sabah State, 1990–2004

Year	Landings (tonnes)	Value (RM million)
1990	1 200	7.200
1991	1 400	8.400
1992	1 500	9.000
1993	1 600	9.600
1994	1 700	10.200
1995	1 700	10.200
1996	1 700	10.200
1997	1 700	10.200
1998	1 700	10.200
1999	89.58	0.985
2000	51.00	0.572
2001	77.09	0.847
2002	74.45	0.818
2003	78.08	0.859
2004	374.51	4.117

of giant freshwater prawns (*Macrobrachium rosenbergii*). Most of the catch is sold to middlemen from Sandakan and a large percentage is exported. It has been estimated that the average annual catch of giant freshwater prawn from each of these two rivers is around 50 metric tonnes.

In addition to Kinabatangan and Segama Rivers, the Labuk River and the Padas River also contribute significantly to the total landing of freshwater capture fisheries in Sabah, in particular to the landings of giant freshwater prawns.

The trends of fish landings by weight, value and major species from 1990 to 2004 are shown in Tables 4 and 5. The figures show a significant decline in total fish landings from 1999 onwards. The modest recovery of catches reported for 2004 might be due to improvements in information-gathering rather than to actual catch increases. Over the years, the habitats in which inland capture fisheries takes place have rapidly deteriorated due to logging activities, pollution from extensive agricultural plantations, overfishing and illegal fishing such as using poison and electro-fishing. Fish catches vary throughout the year.

Sabah has 168 species of freshwater fish species. Major freshwater fish species of commercial value caught and sold in the markets are giant freshwater prawn (*Macrobrachium rosenbergii*), *ikan patin* (*Pangasius* spp.), *lampam sungai* (*Puntius* spp.), *ikan tapah* (*Wallago maculatus*), *ikan baung* (*Mystus* sp.), *ikan lais* (*Kryptopterus* sp.) *ikan kokok* (*Leiocassis* spp.), marble gobby (*Oxyeleotris marmorata*), snakehead (*Ophicephalus* spp.), tilapia (*Tilapia* spp.), catfish (*Clarias* spp.) and *ikan pelian* (*Tor duoronensis*). During the rainy season, the major species caught are *udang galah* (*Macrobrachium rosenbergii*), *patin* (*Pangasius* spp.), *tapah* (*Wallago* spp.) and *baung* (*Mystus* spp.). During the dry season, the major species caught are *lampam sungai* (*Puntius* spp.), lais (*Kryptopteru parvanalis*), catfish (*Clarias* spp.) and *pelian* (*Tor* spp.).

Types of fishing craft and gear

Exact figures on the number of fishing boats used in inland fisheries in Sabah are not available because fishers fishing in inland waters are not licensed. In May 2003, the state enacted the Sabah Inland Fisheries and Aquaculture Enactment 2003, which provides for sustainable development and management of inland fisheries and aquaculture in the state. As of July 2005, however, the Sabah Inland Fisheries and Aquaculture Enactment 2003 has still not been enforced.

It is estimated, however, that there are more than 100 units of fishing boats in the inland waters of Sabah, mostly small wooden boats with and without outboard engines. The most commonly used fishing gears are gill and trammel nets, portable traps, castnets, and hook and lines (Table 5).

As far as the quality of inland fisheries statistics in Sabah is concerned, no proper statistical data collection has been carried out in the past, and fisheries statistics may have been under- or over-reported. The main reason is a lack of training of inland fisheries staff in the collection of fisheries statistics. It was only in 2005 that inland fisheries staff of the State of Sabah received proper training in the collection of fisheries statistics with the help of the Department of Fisheries of Malaysia.

TABLE 5
Major freshwater aquatic species and gears used in Sabah State

Local name of species	Scientific name	Type of gear
Giant freshwater prawn	*Macobrachium rosenbergii*	Portable trap/castnet
Patin	*Pangasius* spp.	Hook & line/ gillnet/ trammel net
Tapah	*Wallago maculatus*	Gillnet/hook & line
Pelian	*Tor douronensis*	Gillnet/ trammel net
Lampam sungai	*Puntius* sp.	Gillnet / trammel net
Baung	*Mystus planiceps*	Gillnet/ trammel net
Haruan	*Ophicephalus* spp.	Gillnet/ trap/ hook & line
Keli	*Clarias* spp.	Portable trap/bubu
Lais	*Kryptopteru parvanalis*	Gillnet/ trammel net
Ketutu	*Oxyeleotris marmorata*	Trap/stow net

4. INSTITUTIONAL PROFILE OF FISHERIES SECTOR

The responsibility to develop the fisheries sector in Sabah falls under the purview of the Ministry of Agriculture Development and Food Industry, Sabah. Development plans are mapped out in every Malaysia Plan with specific approaches and strategies to enhance potential through government programmes. Government agencies under this ministry are entrusted to develop and regulate fisheries-related activities. Each agency has specific functions, ranging from development, marketing and services to enforcement.

4.1 Department of Fisheries of Sabah

The Department of Fisheries (DoF) of Sabah is a state department under the Ministry of Agriculture Development and Food Industry, Sabah. The objectives and tasks of the DoF Sabah include increasing fish production, improving the socio-economic status of fishers, managing and conserving fishery resources, research and development, and regulating and enforcing fisheries laws.

4.2 Ko-Nelayan (Sabah Fisheries and Fisherman's Development Corporation)

Ko-Nelayan was established as a statutory authority for fishermen cooperatives in 1978. Its objectives are to:

- improve the economic and social well-being of the fishing community in Sabah;
- promote and assist in the establishment of fishermen cooperatives;
- increase production of the fishing industry and accelerate the development of aquaculture;
- promote and develop a pool of skilled local entrepreneurs providing ancillary services, including fish processing, marketing and distribution.

4.3 Sabah Fish Marketing Sdn. Bhd (SAFMA)

Sabah Fish Marketing Sdn. Bhd (SAFMA) was established in 1982 to meet the infrastructure requirements for the development of the fishery industry in Sabah. The objectives of SAFMA are to:

- promote commercial operations of the fishery industry from catching and processing to marketing, including the application of modern technologies in fishing operations, and commercial processing and marketing of fish products in both domestic and international markets;
- improve the socio-economic well-being of the fishing community by providing necessary infrastructure, marketing and other services.

SAFMA has a number of facilities, including processing and cold storage plants at Kota Kinabalu, Tawau and Semporna, a slipway and a fishmeal plant at Sepangar Bay, as well as commercial fishing vessels. The main activities of SAFMA are capture fishing operations, and import, export and marketing of marine products, including exporting aquaculture products from Sabah.

4.4 Fisheries associations

There are three main categories of fisheries associations. The first category contains groups from the private fisheries sector that have a common interest to represent themselves in various forums. The main fisheries associations in Sabah are the KK Fishing Boat Owners Association, the Sandakan Fishing (Tong Kang) Association and the Tawau Fishing Association. Associations falling under the second category are formed under the Lembaga Kemajuan Ikan Malaysia Act of 1988, which is called Persatuan Nelayan in various marine fisheries districts. All of these are affiliated to the main body called Persatuan Nelayan Negeri Sabah (PENGASAH) situated at Lembaga Kemajuan Ikan Malaysia (LKIM) State Office in Kota Kinabalu. The third category of fisheries-related associations includes those formed for a specific purpose such as the Sabah Angler's Association.

5. THE SABAH INLAND FISHERIES MANAGEMENT SYSTEM

The State Government of Sabah has recently passed a new fisheries law, the Sabah Inland Fisheries and Aquaculture Enactment of 2003. The Enactment gives the State Fisheries Department wider powers to manage and regulate all fisheries activities in the inland waters of the state. With this new law it is hoped that a sustainable management of the inland fishery resources in the state will be more successfully implemented in the near future than in the past.

5.1 The Community-Based Resource Management (CBRM) programme

Even though the state had no adequate fisheries law for regulating inland fisheries in the first year of the Tagal system, the State Fisheries Department managed to successfully implement the Community-Based Resource Management (CBRM) programme, locally called "the Tagal system", for many of the riverine fishery resources in Sabah. The Tagal system is a smart partnership between communities and the government, with DoF Sabah as the lead agency for protecting, rehabilitating, conserving and managing riverine fishery resources in the state. To participate in this partnership, each community must have traditional use rights, preferably to several deep pools in a river, and manage and use its fishery resources under the leadership of the headman of the community. The state fisheries officers and district officers act as consultants to the Tagal committees.

The responsibilities of the communities are to protect their riverine fishery resources from poaching, overfishing, illegal fishing and from any other activity that may pollute their rivers and water bodies and destroy fish habitats. The communities also have the privilege to harvest the fish once or twice a year in a sustainable manner. The harvest is shared equally among the members of the community.

DoF Sabah plays a number of different roles in the *Tagal* system. When the system started in 2002, DoF Sabah helped in establishing model *Tagal*s to serve as examples. DoF is currently promoting the expansion of the system to new areas that do not yet have this system. It also acts as technical advisor to *Tagal* committees, monitors the progress of all existing *Tagal* systems, carries out research to further improve the system, and implements capacity-building measures. The DoF further promotes ecotourism activities such as catch and release sport fishing, and fish feeding in waters under the *Tagal* management system. These activities attract both local and foreign tourists and generate additional income for local communities.

5.2 Zoning in the *Tagal* system

Tagal-managed riverine fishery resources are divided into three zones – red, orange and green. When a community has five deep pools, the system works as follows. Deep pool number one is classified as a red zone where no fishing is allowed. The water area of this pool is exclusively meant for the conservation of aquatic resources. Harvesting

fish once a year is allowed in deep pools number two, three and four, which constitute the orange zone. Fish caught from deep pool number two and three are equally shared among the members of the local Tagal system. The fish caught from deep pool number four is sold to the public for generating income for the Tagal system. Deep pool number five is classified as a green zone, where fishing is allowed all year round for all Tagal members under strict regulations. Only mesh sizes above 75 mm, hook and lines, and castnets are allowed as fishing gear.

5.3 Financial support of the *Tagal* system

The operation of the Tagal system is financed through annual contributions of Tagal system and committee members, annual sale of catch, sale of catch from fishing competitions, and ecotourism such as boat rentals, sale of food and accommodation, fees charged for sport fishing, fish feeding ventures and similar activities. The income is used to cover administrative expenditure and to support community members in financial difficulties and community festivities.

The *Tagal* system has shown first successes in the rehabilitation of many of the depleted riverine fishery resources of the upstream rivers of Sabah with indigenous fish species such as the *Ikan Pelian Kelah* or Mahseer (*Tor* spp.). As of August 2005, 212 villages in Sabah have been practising the *Tagal* system along 107 rivers. The *Tagal* system is now well known and many other states in Malaysia are keen to introduce and follow it. In 2005, the *Tagal* system was awarded the "Outstanding Sabah Environmental Friendly Project Award 2005" by the Sabah Environmental Action Committee.

6. CREDIT AND MICROFINANCE SUPPORT TO INLAND FISHERIES IN SABAH

Most local inland communities in Sabah, including inland fishers, do not maintain financial records and do not carry out financial management. Hence, it is difficult to monitor the financial performance of inland fisheries activities. For this reason, financiers face the challenge of creating efficient financial instruments that can help to reduce their exposure.

6.1 Financial institutions

The main providers of agricultural and fisheries finance in Malaysia and Sabah are commercial banks, finance companies, merchant banks, Federal Land Development Authority (FELDA), Sabah Development Bank, Bank Pertanian Malaysia (BPM) and Bank Rakyat as well as farmers, fishers and other agro-based organizations. The total loans extended by these institutions by the end of 1998 to the agricultural sector in Malaysia, including fisheries, amounted to RM12.7 billion.

BPM, which was established by the Government of Malaysia in 1969 with the primary objective of promoting sound agricultural development in Malaysia, contributed RM1.9 billion, or 15 percent of the total loan amount. The loans extended by BPM are mainly for financing small and medium-scale enterprises and projects. As of December 1999, a total of RM594.6 million was extended by BPM for financing projects involved in food production. This amount accounted for 23 percent of the total loan amount extended by the banking sector (RM2.6 billion) for food production (Table 6). The credit facilities include loans, revolving credits, trade financing, agricultural equipment financing, interest-free loans and other credit facilities. Malaysian companies, cooperative bodies and individuals are eligible to receive loans from BPM. Financing ranges from production activities to processing and marketing of agricultural products.

The facilities available for financing agriculture, including fisheries, can be broadly classified into two categories: special funds made available by the government through special schemes and for specific purposes, and commercial funds from commercial financial institutions.

TABLE 6
Loans extended for agricultural food production, as of 31 December 1999, in RM million

Sector	Commercial financial institutions		Bank Pertanian Malaysia		Total
	Value	*%*	*Value*	*%*	*Value*
Food crops	1 024.0	78.8	276.0	21.2	1 300.0
Livestock	789.7	82.2	171.5	17.8	961.2
Fisheries	177.8	54.7	147.1	45.3	324.9
Total	1 991.5	77.0	594.6	23.0	2 586.1

6.2 Special funds

The Government of Malaysia occasionally establishes schemes and provides funds for lending to the agricultural sector. Loans from these funds can be considered incentives to promote investments in priority agricultural sectors. The incentives usually take the form of low interest rates, longer duration of financing and higher margin of financing. These schemes are open to all institutions and companies incorporated in Malaysia as long as the ownership by Malaysians is more than 50 percent.

Currently, there are three such funds provided through both commercial banks and development financial institutions: the Fund for Food, the Fund for Small and Medium-scale Industries, and the Fund for Rehabilitation of Small and Medium-scale Industries. These funds are disbursed through financial institutions but regulated by the Central Bank of Malaysia.

The Fund for Food Scheme was introduced in 1993 for financing food production, processing, distribution and marketing. To date, three funds have been launched under this scheme and the total amount allocated is RM1 billion. The objectives of this scheme are to promote food production, reduce the import of food and stabilize food prices. The interest rate charged under the scheme is four percent per annum. The maximum financing is 90 percent of the total project cost, subject to a maximum of RM3 million per customer. The maximum loan duration is eight years.

The Fund For Small and Medium-scale Industries was introduced in late 1997 to promote and revitalize investment in small and medium-scale industries – both in the agricultural and non-agricultural sector – recovering from economic crisis. Under this scheme, loans are provided for financing of manufacturing, services and agro-based industries. A total fund of RM1.5 billion was allocated for the scheme. The interest rate charged under the scheme was 6.5 percent per annum. The maximum financing was 75 percent of the total project cost subject to a maximum of RM5 million per customer. The loan duration was up to a maximum of seven years but not exceeding 31 December 2005. The total amount of loans approved under the scheme for financing agro-based industries in the agricultural sector as of the end of 1999 was RM352 million, with the rest allocated the non-agricultural sector.

The Fund for Rehabilitation of Small and Medium-scale Industries was introduced in 1998 to rehabilitate companies that encountered financial problems during the economic crisis. A fund of RM500 million was allocated for the scheme. The terms and conditions of this scheme are generally similar to the Fund for Small and Medium-Scale Industries.

In addition to the above, there are several other special credit schemes provided by Bank Pertanian Malaysia, namely for rice, tobacco, fruits, vegetables, fisheries, other short-term crops and farm machineries. Funding for these schemes comes from the government. The schemes are especially designed to promote growth in these areas, promote mechanization and automation, and increase participation of the Bumiputra community in agro-based industries.

Unlike loans made from special funds, commercial lending to the agricultural sector is basically market- and profit-driven; hence the terms and conditions are based on commercial considerations. The interest rates charged are normally higher, based on a certain margin above the base-lending rate. A proportionally higher amount of funds

for lending to agricultural projects including fisheries projects will have to come from the commercial financial institutions if the credit needs of the sector are to be met.

7. DEVELOPMENT PROSPECTS AND INVESTMENT AND CREDIT NEEDS OF INLAND FISHERIES

In Malaysia, there are suitable lands and water bodies available for further development of inland fisheries. It is anticipated that the contribution of aquaculture to the total national fish supply will increase from 11 percent in 1995 to more than 30 percent by 2010. This will provide opportunities to develop supporting and downstream industries, including the production of fish feed and fry, fish processing, value-added products and ice factories, etc. There is also tremendous opportunity for ornamental fish culture and its expansion by supporting infrastructure facilities and services to facilitate exports.

The need to increase food supply in the inland ecosystem must take into account the increasing scarcity of water and farmland. There is significant scope for a better integration of agriculture, aquaculture and inland fisheries through an integrated approach. Co-management and community-based management of common property resources must be given increasing attention. At the micro-production level, integration will need to focus on production technologies, such as by-product recycling and improved space utilization. At the macro-level, an integrated economy needs to be organized and structured so that constituent units function cooperatively. Integration needs to be pursued at all levels and should be interdisciplinary; the socio-cultural context of the locality and region must be taken into account. In this regard, human resources development and institutional strengthening will be the primary requirements for achieving better integration at the level of individual farms and communities, in river basins and in coastal area management.

As in the *Tagal* system, successful experiences acquired in protecting and reviving depleted riverine fishery resources in an integrated manner should be further strengthened by encouraging *Tagal* team members to engage in income-generating activities. With adequate credit and microfinance support from financial institutions in Malaysia, team members should look into the possibility of sustainable livelihood diversification and increasing their income by engaging in the following activities:

- pond culture;
- production of fish fry for stocking programme;
- strengthening of ecotourism activities by purchasing more sophisticated and larger boats for boat cruises on rivers with overnight accommodation, and building more resorts and other facilities;
- strengthening of marketing strategies through establishing proper marketing channels;
- downstream activities such as food processing, developing value-added products, operating boat repair facilities, etc;
- better utilization and processing of domestic natural resources.

Greater participation of the private sector and financial institutions in critical areas of food production, post-harvest handling, processing, distribution and marketing is needed to further enhance efficiency and productivity as well as to diversify the structure of production with the view to deepen and widen the country's agro-industrial base. This would entail an increase in the utilization of the country's resource potential to cater to export markets, given that domestic demand alone is insufficient to support this objective. In addition, post-harvest handling, agro-processing and skills that address the environment, consumer health, and worker safety will also be required.

Advanced farm management, agribusiness management, marketing, and enterprise planning become essential skills for dealing with inherent risks and responding to

new consumers, competing prices, changing quality and health standards, contractual specifications and deadlines. Within a more market-driven economic policy framework and guided by the National Agriculture Policy 3 (NAP3), agriculture is capable of facilitating trade expansion and GDP growth, while also generating income and jobs for the poorest part of the population, facilitating more appropriate land and natural resources practices, and providing broader social benefits within an increasingly decentralized political framework.

This publication provides orientation, basic considerations and general principles for those institutions and organizations that provide credit and microfinance services to the fisheries sector, particularly the small-scale fisheries sector, and for those who want to include inland fishers and inland capture fisheries as part of their client base and lending operations. The document has three parts. Part 1 contains guidelines for meeting the credit and microfinance needs in inland capture fisheries development and conservation in Asia. Part 2 contains reports of the proceedings and recommendations of two regional workshops held in 2004 and 2006, from which the guidelines evolved. Part 3 of the document consists of case studies and success stories on: the rehabilitation of inland fisheries and on the access to and utilization of credit and microfinance services with reference to the rehabilitation and development of inland fisheries at Lake Taihu and Lake Luoma in China; management challenges in riverine fisheries along River Ganga and prospects of inland fisheries development in West Bengal and Assam in India; livelihoods at Lake Inlay in Southern Shan State in Myanmar; fishery policy reform and aquaculture development in Cambodia; and community-based rehabilitation and management of fishery resources at river Kinabatangan in Sabah, Malaysia.

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