

Challenges and Opportunities for Aquaculture Co-Management

Lessons Learned from Case Studies

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Lessons Learned from Case Studies

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Executive Summary

Aquaculture is a fast-growing food production sector, expanding at an average rate of ten percent per year and now supplying approximately half of the world's fish supply. Over 80% of the world's aquaculture occurs in developing countries; as a result, aquaculture is a promising tool to reduce poverty and achieve greater social equality as well as to drive economic growth. By providing a low-cost, high-protein source of nutrition to food-insecure populations at a low environmental impact, aquaculture can not only combat poverty and unemployment but also reduce food scarcity and malnutrition. The emerging challenge for the aquaculture industry is finding a way to balance the drive for economic growth with fulfilling the promise of aquaculture as a tool for social empowerment.

Many countries have long traditions of aquaculture, but using local aquaculture expertise as a vehicle of social and economic development is a relatively recent trend. Traditionally, aquaculture development focused heavily on technical, top-down approaches that neglected the ecosystems and communities where aquaculture development actually occurred. In recent years, however, more contextual perspectives have emerged that empower local communities and incorporate resource conservation, management effectiveness, economic efficiency, and social equity into aquaculture development projects. These projects reflect a general trend towards co-management systems that decentralize natural resources decision-making authority to the local level.

Co-management is a power- and cost-sharing partnership that capitalizes on the knowledge and capacities of user groups and the government to create more legitimate, sustainable, equitable, and effective management systems. It is implemented in a variety of forms where different stakeholder groups are empowered in different ways, as appropriate to the resources at issue and the cultural context in which management occurs. Historically used to manage resource extraction, forms of co-management are increasingly being integrated into aquaculture development projects. Attention is therefore needed to identify effective models and practices that ensure that proposed systems are properly structured and implemented to achieve their intended goals in the aquaculture context.

This report uses a case study methodology to investigate aquaculture co-management. The case studies used in this report include a micro-credit system for pond aquaculture in Bangladesh, an international aid-financed trade association in Guyana, a privately-funded, village-based cage aquaculture system in Brazil's Itaipu Reservoir, and a legally-authorized system of community-based organizations that govern capture fisheries in Lake Victoria. By considering these real-world projects, this report illustrates the benefits and pitfalls of different styles of co-management, thereby providing insight on a range of options that could be adopted in the future. It identifies several lessons learned for the successful implementation of future aquaculture co-management systems. These lessons fall into the following categories:

- **CBO Structure and Function:** The community-based organizations (CBOs) used to implement co-management systems on the ground differ substantially in membership, legal authorization, and function. The appropriate structure and formality of these organizations depends on the degree of involvement and the capacity of involved

stakeholders. Legal authority for CBOs is useful for legitimizing these groups and establishing defined communities with consistent funding and institutional support. CBOs that focus on and empower groups, such as women, that are not supported in traditional power structures may be most effective for alleviating poverty in the aquaculture context; however, such groups prosper when they also seek to work with traditional sources of local authority.

- **Legal Compliance:** Aquaculture activities are governed by a wide array of regulators in each country. Compliance with all of their complex demands can be challenging for producers, particularly in the co-management context, which often lacks a concrete basis in legal authority. Attention to legal compliance is necessary prior to initiation of an aquaculture project in order to ensure that compliance requirements that can be met by project participants. If identified early, these potential problems often can be avoided by working with regulators to build in special provisions for co-managed programs or by altering the structure or function of the community-based organization or its aquaculture practices.
- **Coordinated Approaches to Development:** Successful co-management systems uniformly rely on coordinated support and services from multiple government policymakers, NGOs, the private sector, and users. In addition, many aquaculture activities rely on transboundary resources, requiring coordinated international governance. However, experience shows that in many cases, weaknesses in coordination reduce the effectiveness of co-management systems. In particular, complex bureaucratic systems hinder co-management, and successful NGO-led co-management systems may falter when governments attempt to take a more active role in order to capture some of the profit. Long-term, stable arrangements of project partners are beneficial to protect users against conflicting demands.
- **Access to Land and Water:** Access to land and water is a precondition for successful aquaculture, particularly in the freshwater pond context. Particularly in post-colonial environments, land may be consolidated in private and/or state control, so that the poor have insecure tenure. Co-management systems directed at empowering poor communities must address tenure issues at the outset in order to ensure that development programs do not benefit primarily landowners. In addition, successful programs empower community-based organizations to protect use of community lands and waters from non-members.
- **Capacity-Building:** In addition to security of tenure, co-management projects require long-term investments in multiple forms of capacity-building, including, but not limited to, provision of capital, seed, feed, technical support, and environmental monitoring. Government extension services may provide some of these services in some areas, but NGO or private sector support is often needed to provide secure access to these resources to avoid extraction of economic rent by middlemen. Co-management systems are superior to direct support to producers in this respect, as they may be able effectively to disseminate information to other group members, thereby enabling increased retention and further development of community resources.

- **Market-Led Approaches:** In recent years, economic factors have increasingly been considered by international development agencies, NGOs, and governments. Recognition of the importance of these factors has led to market-oriented co-management strategies such as micro-credit and trade associations, and has illustrated that identification of domestic or international markets is important prior to investment in co-managed aquaculture. Successful co-management systems balance economic factors against other important values, such as the environment, in order to build economies that are economically, environmentally, and socially sustainable.

Aquaculture co-management systems for poverty alleviation and sustainable development hold substantial promise. However, the success of aquaculture co-management depends on careful planning and implementation to avoid a range of pitfalls that can doom projects. Careful consideration of the issues identified in this report can assist government, NGOs, and international aid organizations in structuring and executing successful co-management and enhancing food security and prosperity in the developing world.

TABLE OF CONTENTS

ACKNOWLEDGMENTS.....	1
CHALLENGES AND OPPORTUNITIES FOR AQUACULTURE CO-MANAGEMENT	6
I. INTRODUCTION	6
II. COMMUNITY-BASED ORGANIZATION STRUCTURE AND FUNCTION	11
III. LEGAL COMPLIANCE.....	15
IV. COORDINATED APPROACHES TO DEVELOPMENT.....	15
V. ACCESS TO LAND AND WATER.....	17
VI. CAPACITY-BUILDING.....	20
VII. MARKET-LED APPROACHES	20
VIII. CONCLUSIONS	21
BANGLADESH	22
I. INTRODUCTION	22
II. AQUACULTURE IN BANGLADESH	22
III. AQUACULTURE DEVELOPMENT AND POVERTY ERADICATION IN BANGLADESH	24
IV. USING CO-MANAGEMENT TO FIGHT POVERTY: GRAMEEN BANK.....	26
V. CHALLENGES FOR SUCCESSFUL CO-MANAGEMENT.....	28
VI. THE WAY FORWARD.....	30
GUYANA.....	32
I. INTRODUCTION	32
II. AQUACULTURE IN GUYANA	33
III. INSTITUTIONAL STRUCTURE	35
IV. LEGAL STRUCTURE.....	37
V. THE WAY FORWARD.....	44
ITAIPU	45
I. INTRODUCTION	45
II. AQUACULTURE IN ITAIPU.....	46
III. INSTITUTIONAL STRUCTURE.....	47
IV. LEGAL STRUCTURE	48
V. ECONOMIC	50
VI. ECOLOGICAL IMPACTS	50
VII. THE WAY FORWARD.....	51
LAKE VICTORIA	51
I. INTRODUCTION	51
II. FISHERIES MANAGEMENT IN LAKE VICTORIA.....	53
III. INSTITUTIONAL STRUCTURE.....	54
IV. LEGAL CHALLENGES	56
V. THE WAY FORWARD.....	58

CHALLENGES AND OPPORTUNITIES FOR AQUACULTURE CO-MANAGEMENT

I. Introduction

Aquaculture is the fastest-growing food production sector in many countries, making up approximately half of the world's fish supply.¹ Still expanding, the industry has experienced an average overall growth rate of 10% per year since 1984.² Over 80% of the world's aquaculture occurs in developing countries,³ making the industry a natural platform from which to address poverty alleviation and social equality. In fact, the World Bank predicts that aquaculture will be the "most promising source of poverty reduction in the coming years."⁴ In addition to serving as a source of income, aquaculture can help combat food scarcity, rural poverty, unemployment, and malnutrition by providing a relatively low-cost high-protein resource to populations that might otherwise lack access to such foods. In addition, because aquaculture is most often undertaken in conjunction with other activities such as agriculture or capture fisheries, it can provide an important source of supplementary income to the poor.

Many countries have long traditions of aquaculture, but using local aquaculture expertise as a vehicle of social and economic development is a relatively recent trend. Conventional approaches to aquaculture development over the past several decades focused heavily on sector-specific issues, scientific data as dominant knowledge, and top-down approaches. In practice, the centralized development and governance model generally has not accounted for all aspects of the local supply chain, involved local stakeholders in the management process, or considered ecosystem health in a local context. In addition, this approach often has failed to achieve resource management goals. These shortcomings have engendered a broad international philosophical shift towards incorporating resource users in management decisions.⁵

Co-management has emerged as an alternative management paradigm in a variety of resource contexts because it has the potential to address both practical and philosophical concerns driving the move away from command-and-control management systems and development approaches. Co-management has proven especially popular to manage common pool resources, such as capture fisheries, where centralized governance has struggled due to limited management capacity and enforcement. However, new perspectives also have emerged in recent years regarding the best way to incorporate resource conservation, management effectiveness, economic efficiency, and social equity into the aquaculture industry. Because co-management offers a mechanism to balance these goals, it has proven increasingly popular in the aquaculture industry. However, because the goals of co-management may differ substantially in the capture fisheries and aquaculture contexts, the management systems cannot be implemented

¹ State of World Aquaculture 2006, <ftp://ftp.fao.org/docrep/fao/009/a0874e/a0874e01.pdf>

² Id.

³ Halwart, M., Funge-Smith, S., Moehl, J., *The Role of Aquaculture in Rural Development*, Food and Agriculture Fisheries (2001).

⁴ International Bank for Reconstruction and Development/The World Bank, Report No. 36622 – GLB, *Aquaculture: Changing the Face of the Waters* (2006).

⁵ S. Hanna, *The Future of Fisheries Co-management*, in P. Degnbol, *Science and the User Perspective*, in D. Wilson, J. Nielson and P. Degnbol (eds.), *The Fisheries Co-management Experience: Accomplishments, Challenges and Prospects* (Kluwer 2003), p.311.

interchangeably. Careful institutional design is needed to ensure that the goals of co-management are met in individual cases.

This report considers how different forms of co-management have been implemented for aquaculture in three cases and one example of a co-managed capture fishery. By reviewing the structure, history, and relative successes of these case studies, this report both illustrates the range of co-management structures and offers lessons for the successful implementation of co-management for aquaculture in particular.

A. *What is Co-Management?*

A general understanding of co-management is a prerequisite to a consideration of specific cases. Some have cautioned that a precise definition of co-management may be inappropriate because it properly refers to a continuum of management approaches.⁶ Nonetheless, many authors have attempted to define the term or describe the range of approaches within its reach.⁷ This report adopts a broad definition of co-management as “a collaborative and participatory process of regulatory decision-making between representatives of user groups, government agencies, research institutions and other stakeholders.”⁸ More simply, it can simply be seen as any sharing of rights and responsibilities between or among governments, users, and other stakeholders, including, but not limited to, NGOs and industry.⁹

As power- and cost-sharing partnerships, co-management systems capitalize on the knowledge and capacities of user groups and other stakeholders to improve resource management in a variety of ways. A comprehensive study of co-management of fisheries has identified seven resource management functions that can be enhanced by joint action of users and resource managers: (1) data gathering; (2) logistical decision-making (such as who can harvest and when); (3) allocation decision-making; (4) protection of the resource from environmental damage; (5) enforcement of regulations; (6) enhancement of long-term planning; and (7) more inclusive decision-making.¹⁰ As a result of improved management function in these areas, management systems may be more legitimate, sustainable, equitable, and effective.¹¹ However, these benefits

⁶ F. Berkes, P. George & R.J. Preston, *Co-Management: The Evolution in Theory and Practice of the Joint Administration of Living Resources*, 18 ALTERNATIVES 12 (1991).

⁷ See, e.g., S. Jentoft, *Fisheries Co-Management Delegating Government Responsibility to Fishermen's Organizations*, 13 MAR. POL. 137 (1989); E. Pinkerton, *Introduction: Attaining Better Fisheries Management Through Co-Management – Prospects, Problems, and Propositions*, in COOPERATIVE MANAGEMENT OF LOCAL FISHERIES: NEW DIRECTIONS FOR IMPROVED MANAGEMENT AND COMMUNITY DEVELOPMENT (E. Pinkerton ed., 1989); Jentoft, S. & B.J. McCay, *User Participation in Fisheries Management: Lessons Drawn from International Experiences*, 19 MAR. POL. 227 (1995).

⁸ S. Jentoft, *Co-management – The Way Forward*, in K. Geheb and M-T. Sarch (eds.), *Africa's Inland Fisheries: the Management Challenge* (Fountain Publishers 2002).

⁹ See M. Ahmed, A.D. Capistrano & M. Hossain, *Experience of Partnership Models for the Co-Management of Bangladesh Fisheries*, 4 FISHERIES MGMT. & ECOL. 233, 234-35 (1997).

¹⁰ E. Pinkerton (ed.), *Cooperative Management of Local Fisheries: New Directions for Improved Management and Community Development* (U. of BC Press 1989).

¹¹ S. Jentoft, K. Mikalsen, & H-K. Hernes, *Representation in Co-management*, in D. Wilson, J. Nielson and P. Degenbol (eds.), *The Fisheries Co-management Experience: Accomplishments, Challenges and Prospects* (Kluwer 2003).

may not accrue in co-management systems that are poorly tailored to the resource or to local community structure or culture.

Successful co-management relies on the integration (or at least the genuine consideration) of local knowledge and priorities as the basis for increasing legitimacy, accountability, and effectiveness of aquaculture management and development. This requires the devolution of actual rights and authority to local communities to enable them to take part in and influence the process as partners. Without real power-sharing and the devolution of meaningful resource control, there are few incentives for the community to participate in co-management. With a true power-sharing arrangement, however, there is a distinct tension between livelihood concerns and economic development objectives, and accommodating both goals will be challenging. To reach the goals of co-management, institutions and processes must balance the sometimes conflicting priorities of all stakeholders and provide real incentives for all parties to participate actively in the system. In other words, co-management must involve real power sharing and not merely relieve “government of some of its burdens but none of its powers.”¹²

Co-management is not a static or fixed system; rather, it is a process through which communities are empowered to take on management functions related to their natural resources. In practice, however, communities do not interact as a group without an institutional structure to enable such an interaction. As a result, most co-management systems rely on user groups organized with varying degrees of formality. While recognizing that some forms of community interaction may incorporate direct citizen participation in governance (as through public comment), this report examines more structured groups, which it refers to collectively as community-based organizations (CBOs).

Any given co-management arrangement has a sliding scale of responsibilities designated to CBOs and to other stakeholders. The rights and responsibilities allocated to the community level hinges on the capacity of the community and its institutions (whether existing or new) and the goals of the co-management system. Thus, where capacity is limited, co-management may include mere community consultation on issues related to resource management, but where CBOs are well-established and sophisticated, co-management arrangements may devolve substantial management authority to these institutions. Similarly, if the goals of the co-management system include reduced costs, then involving users in the collection of data can provide a low-cost alternative to input-intensive research. Alternatively, if poverty alleviation is a primary goal, then involving the community in long-term planning provides a mechanism for identifying how management decisions will play out within the broader social and economic framework.

Co-management systems must consider not only the appropriate role of CBOs, but also provide appropriate rights and responsibilities to other stakeholders, including the government and NGOs. In any co-management system, the government undertakes a range of specific management functions; that range is often a political question and depends on the particular circumstances of and goals for the co-management arrangement. Government capacity is an important factor in determining the role of the government; in the aquaculture context, governments may not have the capacity to fully perform all regulatory, capacity-building, and

¹² D. Wilson, *The Community Development Tradition and Fisheries Co-management*, in Wilson *et al.*, (eds.).

other functions. Where governments lack enforcement capacity, for example, devolution of that authority to CBOs or NGOs may be desirable to support the success of the co-management system.

The government generally must create an enabling environment for the co-management arrangement by developing and implementing legal authority. This authority may include formal recognition of the legitimacy of the CBOs and their rules, preferably through supportive legislation and policies. Governments also may establish mechanisms for maintaining accountability for local management and institutional arrangements.¹³ In other cases, government interaction with CBOs is mediated by a third party, typically an NGO. In such cases, the government's role is more circumscribed, as no formal legal authority may be needed or desired. However, the government may still be an active partner in co-management by responding to CBO regulatory needs.

Co-management holds far-reaching promise for aquaculture development. As the case studies in this report show, however, co-management arrangements present both general and place-based challenges to user communities, governments, and other stakeholders. These challenges must be addressed carefully if co-management is to fulfill its promise.¹⁴ To be effective, co-management arrangements must account for the particular social, political, economic, and ecological characteristics of the locations in which they take place.

B. Study Approach

This report seeks to derive lessons for the successful implementation of co-management systems for aquaculture production. It uses a case study methodology to determine how a variety of co-management systems have operated in the aquaculture – and in one case, fisheries – context. By considering real-world projects, we hope to illustrate both the benefits and pitfalls of different styles of co-management, thereby providing insight on a range of options that could be adopted in the future.

- **Bangladesh:** In recent decades, aquaculture in Bangladesh has evolved from a subsistence activity to an economically-important industry. While Bangladesh is uniquely suited for aquaculture production in many ways, this development required substantial investment by international donors and the private sector. Many aquaculture development projects have focused on poverty alleviation, among them an initiative by the microfinance community development bank Grameen Bank to support groups of landless Bangladeshis in producing fish in state-owned freshwater ponds. This initiative supported thousands of poor Bangladeshis, but is scheduled to be replaced in coming years by a government-administered leasing program relying on community-based organizations. This case study examines the aquaculture industry and aquaculture development programs and considers the likely impacts and success of government's proposed co-management system. It concludes that the Government's program will likely favor wealthier Bangladeshis than those currently served, and that specific requirements are needed to ensure that the poor have access to CBOs. In addition,

¹³ R. Pomeroy, *The Government as a Partner in Co-management*, in Wilson *et al.*, (eds.).

¹⁴ See generally Geheb & Sachs (eds.), *supra* n. 8; Wilson *et al.* (eds.), *supra* n. **Error! Bookmark not defined.**

continued NGO support is likely needed to provide extension services, including seed stock and technical support.

- **Guyana:** The economy of Guyana, a low-lying country in South America, has historically been based on a production of sugar cane and rice. As the markets for its staple agricultural products have waned, Guyana's government and aid organizations have attempted to diversify the economy in part through supporting aquaculture development. In particular, a USAID-funded project created and continues to support the National Aquaculture Association of Guyana (NAAG), a trade association that includes independent feed producers, seed producers, and farmers engaged primarily in freshwater pond aquaculture, including rice-fish and duck-fish polyculture. NAAG was created based on economic studies to determine markets for, and economic viability of, aquaculture in Guyana. It provides technical assistance to members and advocates for them with government and international agencies. Although it is a young organization, NAAG has had success in attracting diverse members to form a community that meets regularly, exchanging ideas and practices. In addition, productivity has increased on member farms, echoing an increase in total output. However, the group has some weaknesses insofar as it primarily benefits members with land and capital to invest rather than the landless poor. In addition, it excludes 'fly-by-night' operators who exist in contravention of the law due to significant institutional shortfalls in government agency capacity and sophistication. Development of a sustainable industry to aid in poverty reduction will eventually require more inclusive membership and significant collaboration between industry and regulators.
- **Itaipu:** Itaipu Binacional, the dam company jointly owned by Paraguay and Brazil, revised its mission in 2003 to include social and environmental responsibility in the Itaipu Reservoir. Part of this plan included initiating a program to implement aquaculture co-management on the Reservoir. This situation stands out in that Itaipu Binacional, rather than the government, initiated and served as the financier and partner in co-management. Among the many challenges in implementing co-management, some of the biggest involve difficulties meeting various legal and regulatory requirements. These bottlenecks spanned laws both directly and indirectly related to aquaculture, from labor to sanitation laws. Challenges in meeting food safety requirements, for instance, precluded access to markets. Moreover, the existing colonies and associations are not as institutionally embedded in Brazil's legal framework in comparison to other countries, making it difficult to institute a co-management system despite good intent. The scattered nature of Itaipu's challenges highlights the many different social, governmental, and economic aspects that affect aquaculture, particular when there is no overarching national directive that addresses goals of aquaculture co-management. The situation in Itaipu also illustrates that noncompliance with even one facet of regulatory requirements can spell disaster for a co-management scheme.
- **Lake Victoria:** Lake Victoria falls in unequal proportion under the jurisdictions of Kenya (6%), Tanzania (51%), and Uganda (43%). The three countries have worked together to coordinate the management efforts of fisheries around the lake. While capture fisheries almost entirely dominate Lake Victoria, many lessons in regional harmonization

and co-management can be extrapolated to aquaculture co-management in other areas. The institutional structure of community-level beach management units (BMUs) on Lake Victoria creates strong mechanisms for cooperation on multiple levels. Uganda and Tanzania both legally authorize BMUs as fisheries co-management partners through legislation. Over one thousand BMUs exist as lakewide institutions in each country, facilitating organizational consistency, regulatory harmonization, data collection, and enforcement, allowing for consistent management practices throughout the entire ecosystem, systematic enforcement of rules, and experience sharing. While BMUs provide a strong model for community-level organization and government involvement co-management, the region still struggles with balancing government and CBO powers and developing regionally consistent regulations.

The sections above provide a framework within which to analyze the legal and operational structure for co-management emerging in four distinct areas. These diverse case studies illustrate different approaches, obstacles, and lessons for implementing aquaculture co-management. Much of the case study research was conducted through field work, observation, and cooperation with groups in the respective regions. Each of these case studies provided insights to various aspects of aquaculture co-management implementation. The following is an overview of some of the “lessons learned” that have been gleaned from a review of experiences with co-management arrangements around the world.

II. Community-based Organization Structure and Function

Co-management systems generally operate through community-based organizations (CBOs) that represent resource users and, in some cases, the larger local community. The success of co-management systems in driving sustainable development of aquaculture depends on the effective functioning of these CBOs. As a result, the governance structure, membership, and implementation of CBOs are vital components of co-management system design.

In practice, CBOs differ in substantial ways. Some are authorized and organized through formal legal mechanisms, while others are ad hoc groups organized by NGOs or the private sector. Membership in some CBOs is bound by geography, while others determine membership by common interests, gender, economic status, or other factors. Finally, different CBOs are empowered and authorized to take roles ranging from advisory-only to law enforcement. The appropriate mix of these factors depends on the cultural context, the anticipated structure of the co-management system, and the type of aquaculture envisioned.

A. Legal Authority

Some co-management systems rely on direct interaction between government and communities. In such cases, government agencies interface with CBOs that meet the criteria envisaged in the enabling legal authority for the co-management system. In some, but not all, cases, this means that CBOs themselves are directly authorized and enabled through legal authority. Differences in the existence and nature of legal authorities governing CBOs and agency interactions with CBOs may affect the function of co-management systems.

When the government is engaged directly in co-management, supportive legal authorities are useful tools to define the basis, reasons, and goals for co-management. Co-management policies that explicitly address the legal status of CBOs can be particularly useful in allowing CBOs to carry out their management duties. These authorities establish the rights of CBOs to manage the resources, specify the requirements to form or join a CBO, and identify the rights and authorities of CBOs and their members.

The Lake Victoria case study is instructive with respect to the need for legal authority for CBOs. In Uganda and Tanzania, Beach Management Units (BMUs) are authorized through legislation that builds upon and formalizes historical relationships between local communities and the resource. However, in Kenya, BMUs are not legally recognized and do not receive government funding. As a result, the precise roles and responsibilities of Kenyan BMUs must be inferred from the “spirit of the legislation” and members must raise funds from outside sources. The fishing colonies and associations along the Itaipu Reservoir are legally authorized under the national labor laws, which relate more to the social safety net than to natural resource management. The fishery laws do not include specific provisions for colonies or associations to participate in fisheries management. This may be a contributing factor to comparatively low participation by Itaipu colonies, along with the changes to the fishery caused by creation of the reservoir. Some colonies were displaced from their original river locations and now are scattered along various areas of the Reservoir, hindering implementation of reservoir-wide plans and information-sharing among fishermen. Thus, CBOs operating without enabling authority or legal recognition with respect to natural resource management are at increased risk of failure due to lack of government backing and funding and lack of legitimacy as a partner in co-management. These organizations nonetheless may be extremely effective under some forms of co-management, but they may require substantial non-governmental support in such cases.

In cases in which CBOs co-manage aquaculture with NGOs or the private sector, close coordination with government agencies and officials – including legal recognition – may still be important. In Bangladesh, for example, the Grameen Bank faced a major setback when the government of Bangladesh declined to extend long-term leases to the ponds. The government announced that the Department of Fisheries would assume responsibility for developing a new plan for those communities, thereby shifting the co-management system from an NGO-led initiative to a government-led one. In this case, the legal status of the new CBOs and the identity of their members remain in doubt; it is unclear whether the new CBOs will have the same management authorities or makeup as the informal management groups they will replace. Had Bangladesh established general CBO authority, the uncertainty related to the change from private to public management would be considerably decreased.

The contours of CBO authority vary widely, ranging from information-sharing to direct enforcement of the law. No single model for legal authorization is appropriate in all cases. Rather, co-management systems and the CBOs used for their implementation should be tailored to the demands of particular projects, balancing the specificity needed to enable consistent implementation against the flexibility needed to accommodate innovations and changes in priorities and to adapt to the increasing capacities of the parties involved. For instance, legislation might define broad roles for CBOs to undertake, but leave specific details of CBO operational and administrative functions to CBO bylaws or rules determined by CBO members.

Particular questions arise repeatedly when policymakers create legal authorization for CBOs. These include:

- Who determines rules about implementation of co-management and resource use?
- Do CBOs have exclusive rights for resource extraction?
- What are the roles of the community and the government with respect to monitoring and enforcement?
- How will conflicts be resolved, both within and among user groups?

Governments must answer these questions in order to effectively delineate the precise structures and operations of CBOs. In answering these questions, successful co-management systems integrate and engage all stakeholders, including regulators, civil society, private sector representatives throughout the supply chain, and traditionally unempowered groups. By seeking input from all interested groups, governments can incorporate consensus answers to these questions into appropriate legislation.

B. Defining Communities

Legal authority aside, CBOs differ in fundamental ways. One important difference lies in the community that is represented. Eligibility for CBO membership defines the community able to participate in co-management. CBO membership can be determined by geographic location, as in the case of the fishing communities located around Lake Victoria and villages around the Itaipu Reservoir. Alternatively, the eligible community can be defined by interest, as illustrated by the National Aquaculture Association of Guyana (NAAG), a national trade association for independent farmers and feed and seed producers. Community membership can also be limited by identity, such as systems that admit members based on gender, income, or land ownership; in Bangladesh, for example, Grameen Bank created groups of exclusively landless Bangladeshis, with a preference for women.

By privileging traditionally marginalized groups within the community, co-management systems can empower traditionally underrepresented voices, such as women, indigenous people, and the landless poor. Gender and class stereotypes in particular are often deeply rooted; CBOs can affirmatively ensure the active and meaningful participation of these groups so that they have equal or exclusive opportunities to benefit from co-managed aquaculture. Empowerment of traditionally unrepresented groups is particularly important in co-managed aquaculture, as compared to capture fisheries. While capture fisheries often focus on limiting catch, aquaculture focuses on using community to increase productivity and eradicate poverty. As such, the Grameen Bank's community group structure can be seen as a successful model.

Limitations on membership and power within CBOs can also serve other goals, notably including ensuring representation of all relevant stakeholders. In Uganda, where CBOs are formalized within the legal framework, BMUs hold elections to determine leadership positions and further require that 30% of the leadership seats must be women, 30% must be boat owners, and 30% must be members of fishing crews. Similar types of diversity requirements can increase democratic representation of and within small communities – particularly those where traditional power structures are dominated by certain demographics or sectors. Legally mandating that a certain percentage of the institutional leadership positions be given to these groups is one

possible step. Such requirements, however, must often be supplemented by outreach and capacity building activities because fulfilling representation quotas does not necessarily mean marginalized groups have a legitimate voice in the decision-making processes.

The relationship of co-management institutions to other local institutions, including traditional or customary authorities, is also important. Appropriate integration of local institutions and rules with new co-management systems can bolster the legitimacy of co-management arrangements and create institutions and processes that are locally meaningful and resilient. In Lake Victoria and Itaipu, previous iterations of BMUs and fishermen colonies existed decades before co-management programs were initiated, and both regions used those existing structures to transition to co-management. Failure to account for these institutions, whether formal or informal, on the other hand, can undermine the legitimacy of co-management in the eyes of the community and create conflict with newly created authorities and power structures.

C. Statewide and Regional Interactions

CBOs can increase community representation in politics. Creation of structures for formal organization and provision of responsibility for resource management both legitimize community desires and provide mechanisms for groups to contribute to policy debates in a structured and meaningful way. Perhaps most important, CBOs enable collective negotiation with regulators. Formal legal recognition is not a prerequisite to influence; for example, NAAG enables the Guyana aquaculture industry regularly to interact with agencies to resolve legal issues. However, formal authority may allow local communities to interact with regulators as equals, and regulators may consider the views of such entities more seriously. In addition, CBOs can drive interagency collaboration to solve problems as a group.

CBOs are also important as conduits to channel support into local communities. Government agencies, NGOs, and industry often engage in a variety of capacity-building activities, including but not limited to information dissemination, technical training, and supplying equipment and capital. If appropriately structured to empower underprivileged groups, CBOs may be eligible to draw upon some or all types of this support. For example, NGO-led capacity building will remain important after Bangladesh assumes control of the Grameen Bank fish farm; if Bangladesh requires the subsequent CBOs to retain the focus on landless groups and women, they will be more likely to attract support in the future.

In addition to aiding external relations between other stakeholders, CBOs facilitate inter-community cooperation by connecting aquaculturists across geographic space. Often in cooperation with the government or other stakeholders, CBOs provide an organizational structure for conflict resolution between groups sharing resources, as well as for coordinating user groups at larger scales. BMUs have been particularly useful in this regard in Lake Victoria, where communication among CBOs allows individual communities to implement consistent management practices across entire the ecosystem, to adopt standardized methods of rule enforcement, and to share best management practices.

III. Legal compliance

Like many industries, aquaculture typically is subject to oversight by many regulatory bodies. While the agriculture and fisheries departments may bear primary responsibility for licensing, permitting, and marketing support for aquaculturists, their actions form only a small part of total regulatory oversight. Other agencies govern environmental issues (including water and air pollution and biodiversity conservation), health and welfare issues (including food safety), labor issues, and water usage (drainage and ditch governance). Aquaculture producers, including CBOs, must comply with the myriad rules established by each of responsible regulators; as shown by the Itaipu case study, noncompliance with even one facet of the regulatory requirements can doom a co-management scheme.

While all regulations are important, certain types of noncompliance are more likely to stall co-managed aquaculture projects. First, domestic laws take primacy – and particularly those that deal with concrete requirements that are easily enforced and have been adopted by the private sectors, such as food safety requirements. In contrast, less administrable laws, such as those dealing with water pollution, have less direct effects on aquaculture development absent strong government enforcement – a rarity in developing countries due to capacity limitations within government agencies. Similarly, international legal obligations are unlikely to have much impact unless they are effectively implemented in domestic law.

In addition to direct mandates, the incentive structures created by domestic laws affect the success of aquaculture co-management. Labor laws and benefits systems appear to be particular issues for aquaculture, which is by its nature a seasonal, part time occupation. Where substantial social programs exist, as in Brazil, the benefits of aquaculture to small-scale producers may be less than the benefits accrued by not working. As a result, co-management systems may be best suited to developing countries without comprehensive social safety nets.

Ideally, legal compliance issues should be considered as part of pre-project planning. Identification of the issues related to legal compliance is the first step to addressing legal compliance and should be followed by capacity-building throughout the supply chain to react to noncompliance and, if necessary, by work at the regulatory level to respond to the needs of co-management and of aquaculture production. Compliance problems, as demonstrated here, have a high degree of risk. As in Itaipu, participants are unlikely to invest time, effort, or capital in aquaculture if they will be unable to legally sell their product. Alternatively, factors such as lax enforcement, poverty, and substantial economic benefits to noncompliance may support systemic noncompliance and black markets, as in the Guyana shrimp industry. Because of the risks of noncompliance, legal issues merit substantial attention in the co-management context. The degree of attention needed for legal compliance depends on the complexity of the regulatory regime at issue in particular locations; thus, compliance issues are particularly acute in more developed countries.

IV. Coordinated Approaches to Development

The need for and difficulty of coordinating multiple actors is a primary reason for the rarity of successfully-implemented aquaculture co-management projects. Coordination plays a major role

in every case study discussed in this report; however, the form and nature of the cooperative ventures differs in each case. Government-to-government interaction is important in Lake Victoria and Itaipu, for example, while government-to-NGO and government-to-private-sector interactions are more important in Guyana and Bangladesh. In addition, intragovernmental, agency-to-agency collaborations are important in each case. Regardless of these differences in form, successful co-management systems have created shared visions and have successfully coordinated actions across jurisdictional and organizational boundaries.

Two case studies discussed in this report address transboundary resources. In both Lake Victoria and Itaipu, co-management structures were developed for use in waterbodies subject to control by multiple countries. The difference between these case studies illustrates the importance of intergovernmental linkages. The Lake Victoria Fisheries Organization is explicitly intended to drive regional harmonization of laws and community-based organizations (CBOs) (in this case, Beach Management Units, or BMUs). This mandate has led to substantial similarities between approaches to co-management in each location. On the other hand, the Itaipu project was limited to Brazilian fishers due to a lack of interest from the Paraguayan government. As a result, the efforts of Itaipu Binacional were not duplicated across the lake.

All transboundary resources – including both riparian lands and waters and lakes – require some degree of intergovernmental coordination to avoid negative externalities due to overharvesting of commons. In comparison with extractive industries like capture fisheries, aquaculture suffers less from such externalities. However, some aquaculture practices in one country will have repercussions on resources in neighboring countries that share the resource. For example, water pollution, introduction of nonnative species, and impoundment may all affect downstream users. Thus, had the Nile Perch been introduced into Lake Victoria for aquaculture, it would nonetheless have affected other sectors (i.e., capture fishing) and other countries. As a result, regional approaches are needed to promote sustainable aquaculture that does not negatively affect users in neighboring countries.

Implementing regional harmonization for transboundary resources depends in large part on the creation of binding legal mechanisms mandating sharing of resources, guaranteeing access, enabling cross-border enforcement, and effectively allocating resources. Moreover, where a co-management system is anticipated, such agreements are needed to establish the structure, function, and legal authority for the community based organizations. Where such agreements exist – as in Lake Victoria – they can substantially affect the direction of resources management and co-management. However, creating these legal authorities is not simple, as it requires high-level interaction between governments. As a result, there is a role for regional non-governmental organizations – whether independent or multilateral – to promote the harmonization agenda by identifying and filling gaps and inconsistencies on behalf of users.

In addition to transboundary resources, coordination also is needed for effective management of resources within countries. In effect, effective aquaculture development – whether or not linked to co-management – requires effective interagency collaboration and consistency. For example, a lease may be required to develop a farm on a tract; in addition the farmer may require a permit to divert water from a canal, a permit to stock the pond, and certification that the products will be safe for sale as food. If these requirements conflict, aquaculture may not be possible. The more

complex the regulatory regime, the more likely that the farm will falter or evade regulatory oversight, as commonly occurs with respect to the Sea Defense in Guyana. However, where agencies communicate to reduce bureaucracy, development will be quicker and less costly.

Effective co-management can reduce barriers to development by enabling joint efforts to obtain necessary permits as well as to enforce legal requirements. However, the use of co-management also heightens the need for interagency coordination. As noted in the previous section, many agencies govern each project, each of which balances a unique mandate using its limited resources. These factors can complicate creation, implementation, and enforcement of rules as well as the provision of extension services. Both legally authorized and non-legally authorized CBOs can act as catalysts for collaboration among various government agencies and other stakeholders. In cases where aquaculture programs are implemented through legally-authorized community based organizations, these organizations must negotiate not only their own governing authorities but also interact with other agencies to obtain authorization to provide needed services, including information-sharing and enforcement, to their members.

Finally, effective aquaculture co-management requires governments not only to collaborate with each other, but also to build partnerships with the private sector, including both NGOs and industry. As will be discussed in further detail, because government capacity is limited, NGO expertise is needed to provide services, such as education and technology transfer, that government agencies are often unable to effectively provide to CBOs but which are necessary for successful aquaculture development. Thus, USAID funding supports aquaculture in Guyana in part through supporting the aquaculture association's training and extension services. In many cases NGOs interact directly with the government on behalf of CBOs. For example, in Bangladesh, Grameen Bank interacted directly with the government to support its microcredit-based aquaculture development. In such systems, the private sector directly represents the CBOs, making government-NGO coordination the sole linkage between regulators and users.

Each of the case studies in this report has shown that the need for coordination between government agencies and the private sector is a prerequisite to effective co-management for aquaculture, regardless of the nature of the relationship between the government and the users (i.e., the legal status of CBOs does not affect the need for NGO involvement). To the contrary, creation of co-management systems requires active engagement by all stakeholder groups, including the government, users, aid organizations, NGOs, and industry sectors throughout the complex aquaculture supply chain.

V. Access to land and water

Access to land and water is a necessary, but not sufficient, condition to successful aquaculture development. Land and water constitute the basic resources for aquaculture, yet in many places, the mechanisms for access and control over these resources are complex, opaque, and provide substantial disincentives to investment. Where these hurdles apply, overcoming them should be a priority of any co-management system.

The problem of access to land and water for aquaculture for co-management purposes is particularly significant in the aquaculture context. Prototypical co-management systems in

capture fisheries, in contrast to aquaculture, do not typically require physical land (or water) tenure. To the extent that aquaculture development relies on physically constrained spaces and exclusion of other users from those spaces, access issues are likely to play more substantial roles in co-managed aquaculture projects than in corresponding projects in other sectors.

Access issues historically have been particularly problematic for projects focused on poverty alleviation. In many cases, the landless poor have no secure access to resources on either private or public lands; as a result, providing secure access becomes a primary goal of poverty-focused programs. Some approaches to co-management do not focus on the landless poor, however; for example, the members of the industry-led Guyana project may be assumed to have secure access to lands. As the Guyana project is intended to create a new market for aquaculture products rather than to deliver specific services to the rural poor, this focus on comparatively-wealthy landholders is appropriate. By contrast, securing access was a primary concern to the Grameen Bank Bangladesh project, which focused directly on alleviating poverty.

The success of efforts to secure land tenure requires attention to the context and structure of land tenure in particular locations. Countries and areas where most lands are subject to private control require different approaches to securing access than places where most lands are subject to state control. For example, while the Itaipu project required collaboration between the electric power company and local communities, projects in Guyana and Bangladesh have required negotiation of leases from public agencies. While public lands may be less expensive to secure than private lands in many cases, security of land tenure on those lands appears to be a particular issue in post-colonial countries where large amounts of land are subject to state control. For example, leases in Guyana must be obtained through a complex bureaucracy, and leases can be cancelled at any point during the lease term. Similarly, while Grameen Bank was able to secure a 25-year lease for its project in Bangladesh, the government declined to extend that lease, thereby terminating the project.

The limitations on leasing of state lands are important due to the long-term nature of aquaculture co-management projects and, in particular, to the need to provide incentives for investment by industry participants. First, security of tenure is necessary to provide participants – including capital-rich NGO or government program operators – with incentives to invest in improvements to lands for aquaculture. Such investments are commonly necessary to support increased production that can support substantial numbers of program participants. Second, assuming sufficient security of tenure to support investment, aquaculture co-management programs must still be protected against negative outcomes if they are successful. Productive co-management programs in practice have been substantially capital-constrained, making them vulnerable to speculation in competitive leasing environments. In addition, governments may have incentives to value maximization of income from leases over the contribution of leases to poverty alleviation. These incentives may conspire to limit the long-term feasibility of co-management systems on public lands.

Finally, the case studies discussed herein have shown that access and tenure issues differ between lake-based and pond-based aquaculture co-management systems. That is, the context in which production occurs largely determines the attention to access that is required. In contrast to ponds, lakes are ‘community resources’ – that is, they are commons that are open to all. Such

open access systems do not require investments in tenure, but they have their own particular issues, such as poaching and overfishing. Thus, in these cases, the ability to *exclude* is often more problematic than the ability to access the resource. In most cases, the policy response to address this issue is to require permits for access. While generally not as problematic to obtain as long-term leases, permits nonetheless can be subject to problems of speculation, as in Bangladesh. Second, lake-based aquaculture generally will require the authority to place physical structures in the water over long periods, raising additional permitting issues and potentially conflicting with capture fishing or other uses of the area. Thus, while lake-based aquaculture programs facially require less attention to access issues, the specific requirements that pertain in particular countries or waterbodies may nonetheless require consideration and proactive development of solutions.

VI. Capacity-building

Establishing appropriate organizational and legal structures alone will not guarantee successful co-management. Capacity building is vital to ensuring that local institutions have the skills and equipment they need to effectively implement the goals of co-management, and there is a record of failure when this is not adequately addressed. Capacity building can range from tangible supplies such as seed, feed, and equipment, to intangible provisions such as information and organizational support. Examples of the latter include making available information regarding aquaculture support programs, assigning designated liaisons in the government, NGOs, or the private sector to communicate with local-level institutions, and providing technical expertise to local fishermen.

The Food and Agriculture Organization classifies types of aquaculture extension in five general categories:

- (i) Technology transfer: farm installation and construction, culture techniques, pond maintenance practices, and disease diagnosis training
- (ii) Supply chain connection: linking fishermen with other parts of the supply chain by ensuring mechanisms for obtaining seed, feed, fertilizers, drugs, and other equipment necessary to practice aquaculture, as well as connecting fishermen to processors
- (iii) Financial support: direct monetary aid or facilitating access to credits, loans, and other financing bodies
- (iv) Marketing: educating sellers and consumers on product development and marketing
- (v) Technique training: educating fishermen in aquaculture techniques¹⁵

Different places will have unique needs depending on regional, political, and social circumstances. Support can also come from various sources. Often, particularly in countries with strong central governments, many aspects of assistance come from the state. However, capacity building assistance can also come from local civil society organizations, international NGOs through development aid, and the private sector.

¹⁵ FAO, *Curriculum for the Training of Aquaculturists in the Latin American Regional Centre for Aquaculture*, at <http://www.fao.org/docrep/L8156E/l8156e0j.htm> (last visited Feb. 26, 2010).

Different sources of capacity-building can supplement each other in areas where one source may be deficient, and decentralized, integrated approaches to capacity building can build on the strengths of various stakeholders. One of the reasons underlying the failure of centralized systems to achieve their fisheries and aquaculture management goals is the lack of resources available to implement extension and monitoring and enforcement activities. For example, governments may be limited in aquaculture knowledge, co-management experience, funds, or staff capacity to run extensive capacity building programs.

On the other hand, local NGOs often have long-standing relationships with fishing communities, while international organizations can provide strong technical expertise in the industry and experience with implementing co-management systems. Sometimes, as in the case of Itaipu, the private sector acts as the main contributor of capacity building. Itaipu Binacional, the company managing the Itaipu Dam, initiated aquaculture co-management in the Reservoir under its “Cultivating Good Water” program designed to involve local communities in sustainable social and economic development of the area. The company provided capital, cages, feed, seed, and processing facilities for the participating fishermen. Yet, because Itaipu Binacional lacked experience in the legal and regulatory components of establishing aquaculture co-management, it had to work with government officials and NGOs. This demonstrates the importance of recognizing the need for integration between sources of capacity because, in most cases, no single source is sufficient alone.

The final component to capacity building is creating a self-sufficient system in which the fishing communities can manage their aquaculture systems without the continued provision of inputs. Because it is a relatively nascent field, few models for successful implementation of aquaculture co-management exist. This is one area that aquaculture and fisheries co-management differ, in that the production chain for capture fisheries is much shorter, and they do not require continual replenishment of fry or food to continue.¹⁶ The current examples of aquaculture co-management still require long-term support to thrive.

VII. Market-led approaches

Because market demand is necessarily the driving force behind successful aquaculture endeavors, successful aquaculture ventures will have identified market options prior to investment and project implementation. This factor is a bottleneck in Itaipu; some local schools, hotels, and restaurants expressed interest in buying the fish produced from aquaculture around the Reservoir, but no clear commitments were made. On the other hand, the Guyana trade association project was based on specific economic analysis to determine potential marketability of products. The ability to quantify the benefits of aquaculture to potential participants played a role in successful recruitment of producers and other members of the supply chain into the association.

The Itaipu example also ties into cultural differences as a factor of market success. Brazil, like many other places in Latin America, does not have a strong tradition of fish consumption. On the other hand, aquaculture is a strong industry in China and Southeast Asia, where fish consumption is high. Fishermen in developing countries relying on local markets often face

¹⁶ The International Bank for Reconstruction and Development/The World Bank, *supra* note 4.

more lenient food quality restrictions. In places without large domestic markets for fish, however, fishermen must turn to international markets where sellers likely face higher food quality and sanitary standards, trade barriers and tariffs, and different tastes or preferences for fish that may not be native species. Any shifts toward export aquaculture will also be accompanied by growing concerns over food safety, traceability, and certification.

VIII. Conclusions

One size does not fit all – there are many unique circumstances and solutions must fit particular cases.

Aquaculture co-management systems for poverty alleviation and sustainable development hold substantial promise. However, the success of aquaculture co-management depends on careful planning and implementation to avoid a range of pitfalls that can doom projects. Careful consideration of the issues identified in this report can assist government, NGOs, and international aid organizations in structuring and executing successful co-management and enhancing food security and prosperity in the developing world.

BANGLADESH

I. Introduction

In recent decades, aquaculture in Bangladesh has evolved from a subsistence activity to an economically-important industry. While Bangladesh is uniquely suited for aquaculture production in many ways, this development required substantial investment by international donors and the private sector. Many aquaculture development projects have focused on poverty alleviation, among them an initiative by the quasi-NGO Grameen Bank to support groups of landless Bangladeshis in producing fish in state-owned freshwater ponds. This initiative supported thousands of poor Bangladeshis, but is scheduled to terminate in coming years, to be replaced by a government-administered leasing program relying on community-based organizations. This case study examines the aquaculture industry and aquaculture development programs and considers the likely impacts and success of government's proposed co-management system.

II. Aquaculture in Bangladesh

During the rainy season, as much as a third of Bangladeshi territory is submerged. Under these conditions, it is no surprise that aquaculture is important to the country both as a protein source and as a major element of the economy. In fact, Bangladesh is the world's second leading aquaculture producer,¹⁷ with over one million tons produced in 2007-08.¹⁸ In combination with capture fisheries, FAO estimates that aquaculture production provides more than 50% of the country's total animal protein intake.¹⁹ In addition, recent estimates suggest that capture and culture fisheries support more than 7% of the nation's population.²⁰

Aquaculture has a long history in Bangladesh, dating back at least several centuries, when the country's natural water bodies were stocked with wild seed stock during the monsoon season. These resources were historically controlled by Hindu kings, and control over inland areas evolved during British colonial rule and after independence. "The East Bengal State Acquisition and Tenancy Act (EBSATA) of 1950 abolished the Zamindari system that existed for more than a century under the British colonial rule. Zaminders were local landlords who possessed the property rights over all land and water within their estates. With the enactment of EBSATA fisheries became state property under the jurisdiction of the Ministry of Land. The government policies continued to use the fisheries to generate revenue through short-term (1–3 years) leases of fishing rights to the highest bidder, who happened to be the rich money lenders or profit-seeking intermediaries.²¹ This system persists today, with the Ministry of Land responsible for

¹⁷ U.N. Food & Agric. Org., THE STATE OF WORLD FISHERIES AND AQUACULTURE 2008 16 (2009) [hereinafter SOFIA 2008].

¹⁸ Fisheries Resources Survey System, Department of Fisheries, Ministry of Agriculture and Livestock, FISHERIES STATISTICAL YEARBOOK OF BANGLADESH: 2007-08 (2009) [hereinafter DoF Yearbook].

¹⁹ SOFIA 2008, supra note 17, at 9.

²⁰ U.N. Food & Agric. Org., Bangladesh National Aquaculture Sector Overview, available at http://www.fao.org/fishery/countrysector/naso_bangladesh/en [hereinafter Sector Overview].

²¹ M. Ahmed, A.D. Capistrano & M. Hossain, *Experience of Partnership Models for the Co-Management of Bangladesh Fisheries*, 4 FISHERIES MGMT. & ECOL. 233, 235-36 (1997).

leasing areas used for fisheries but the Department of Fisheries responsible for regulating fishing-related practices, including aquaculture.

In recent years, inland fisheries have declined due to flood control efforts, which reduce seasonal flooding. As a result, aquaculture has increased in importance even as wild seed stocks have decreased; as a result, efforts to produce artificial seed have increased. Efforts to expand the sector focused initially on breeding of both native and exotic species of carp in freshwaters and, more recently, on shrimp production in coastal areas. While shrimp farming remains the primary activity in coastal aquaculture, inland freshwater culture is more diversified and includes species such as tilapia, catfish, snakeheads, and other indigenous species.

The production from all types of aquaculture has been growing steadily.²² However, coastal and freshwater systems have substantial differences in scale and practice. The 1.3 million fishponds used for freshwater aquaculture range from 0.02-20 ha, but the average is only 0.3 ha.²³ In total, there may be as many as 5 million homestead fishponds in the country, many of which may not have been counted in official statistics.²⁴ Additional farming occurs – albeit much more rarely than ponds – in cages, oxbow lakes, and through integrated methods (e.g., duck/carp and rice/fish culture). The Asian Development Bank estimates that small pond carp polyculture accounts for 80% of freshwater production, while the remaining 20% results from commercial ponds, cages, and fish-rice culture.²⁵ For the majority of ponds, aquaculture is a secondary or tertiary use of resources; ponds may be used for a variety of purposes ranging from rice farming to household use. As a result, ADB concluded that “[t]here are no significant adverse environmental impacts” from the small-scale carp polyculture that dominates national production.²⁶

Freshwater aquaculture ranges from extensive – i.e., stocking with carp without supplementary feed or fertilization – to intensive, such as monoculture of striped catfish or pangas with regular commercial feed application. Between these endpoints, aquaculturists carry out different levels of supplementation, including through the provision of different stocking mixtures, fertilizer additions, and feed types. Ponds in particular are increasingly subject to intensification through methods such as polyculture and management techniques such as pond preparation, stock density, feed and fertilizer use, and water use. As a result, total production and yield per hectare have both increased rapidly since the 1980s.²⁷

On the other hand, shrimp farming has exploded since the 1980s, when such farms covered less than 20,000 ha, to 140,000 ha in 1995, to 203,000 ha in 2003, and finally to a latest reported area of 217,000 ha in 2008.²⁸ At the same time, shrimp production has expanded from simple enclosures without supplemental feed to more intensive farming methods. As a result, shrimp

²² Sector Overview, *supra* note 20

²³ Sector Overview, *supra* note 20

²⁴ N. Bestari et al., *Case Study 1: Overview of Small-Scale Freshwater Aquaculture in Bangladesh*, in AN EVALUATION OF SMALL-SCALE FRESHWATER RURAL AQUACULTURE DEVELOPMENT FOR POVERTY REDUCTION (Asian Development Bank 2005).

²⁵ *Id.*

²⁶ *Id.* at 5.

²⁷ Sector Overview, *supra* note 20

²⁸ DoF Yearbook, *supra* note 18, at 1.

farming requires substantial capital but also produces substantial returns – up to US\$150,000 per ha.²⁹ However, intensive shrimp farming in Bangladesh, like in neighboring Thailand, has been subject to period disease outbreak and has resulted in the destruction of coastal mangrove areas.³⁰

Differences between freshwater and coastal aquaculture are not limited to production systems. Although intensification has increased the productivity of freshwater aquaculture, most products remain low-value and, as of 2001, 97% of production was marketed domestically or used for subsistence.³¹ While the amount exported has increased from less than 1000mt to over 20,000 mt in the last decade (corresponding to 495 crore taka, or US\$71 million³²), the export of chilled and frozen fish remains a small part of the overall freshwater sector.³³ In contrast, shrimp are commonly exported for sale; according to the most recent statistics, shrimp production has held relatively steady since 2004 at about 50,000mt per year, valued at almost 3000 crore taka (US\$435 million).³⁴ Fisheries and aquaculture provide a substantial portion of exports from Bangladesh.

III. Aquaculture Development and Poverty Eradication in Bangladesh

Poverty in Bangladesh is pervasive, with 47% of the population below the poverty line as of 1995-96. Land ownership is a key factor in poverty; extremely poor Bangladeshis are uniformly landless, without homestead or arable lands, and many additional poor Bangladeshis are functionally landless, with access only to small homestead lands. Even among marginal households with access to limited amounts of land (0.2-0.5 ha), 44% live in poverty. As land ownership increases, poverty levels decrease, although 16% of even large landowners (>2 ha) live in poverty.³⁵

While the Bangladeshi aquaculture industry has grown by leaps and bounds in recent decades, that growth has not occurred evenly; rather, large-scale operators have benefited the most from development, while the poor have struggled to participate in the sector due to issues including, but not limited to, access to facilities and unrealistic capital requirements. These difficulties have persisted despite the efforts of international development agencies, which have invested substantially in the Bangladeshi aquaculture industry – and particularly in freshwater aquaculture – as a means of poverty reduction.

Since the late 1970s, a variety of aid organizations have undertaken a series of development programs increasingly focused on small-scale freshwater aquaculture.³⁶ For example, the Asian Development Bank (ADB), along with the International Fund for Agricultural Development and

²⁹ Sector Overview, *supra* note 20.

³⁰ Bestari et al., *supra* note 24. Compare Ben Belton & David Little, *The Development of Aquaculture in Central Thailand: Domestic Demand versus Export-Led Production*, 8 J. AGRARIAN CHANGE 123 (2008).

³¹ Sector Overview, *supra* note 20.

³² Crore means ten million in Bengali; Taka is the unit of currency.

³³ DoF Yearbook, *supra* note 18, at 41.

³⁴ DoF Yearbook, *supra* note 18, at 41.

³⁵ Bestari et al., *supra* note 24, at 3-4.

³⁶ *Id.* at 10-12.

the Government of the Netherlands,³⁷ funded two projects specifically to produce a “sustainable increase in agricultural production and income for smallholder farms” in western Bangladesh.³⁸ Tied to irrigation and flood control projects, these projects sought to compensate for the associated loss of floodplain fisheries traditionally relied upon by the landless through micro-infrastructure developments such as pond excavation for lease to groups of the poor, providing access to supports needed to carry out aquaculture activities, and providing skill development assistance.³⁹ Other development programs have sought to increase access to non-farm employment in the sector via sale of seed stock, pond construction, and fish marketing.

The ADB evaluated its freshwater rural aquaculture development programs in 2005.⁴⁰ As part of its evaluation, the ADB carried out several case studies focused particularly upon pond aquaculture in Bangladesh. Its overview of small-scale rural aquaculture in Bangladesh illustrates the hurdles to effective development of aquaculture for poverty eradication, most notably including access to land and water. As noted by ADB, development efforts focused on aid to the landless poor have taken several approaches to overcome access to land, including advocacy for cage farming, rice-fish farming, fish pens and other communal enclosures of floodplains.

Despite efforts specifically to target the poor and to build communal management structures, ADB’s 2005 review concluded that “[d]irect beneficiaries of aquaculture development have largely been pond owners among small- (0.5–1.0 ha) and medium-scale landholders (1–2 ha) Conventional aquaculture development initiatives that emphasize the promotion of technology and provision of targeted extension services are unlikely to reach the functionally landless and the extremely poor.”⁴¹ Secure access to land and water remains the primary hindrance to the use of aquaculture for poverty eradication in Bangladesh; however, other factors also limit the effectiveness of development projects. These include: (i) access to information; (ii) access to human, social, and economic capital; (iii) access to infrastructure; (iv) access to development resources; (v) seasonality of aquaculture production; (vi) theft; and (vii) seed stock availability and quality.⁴²

In addition to hurdles to effective implementation, it is important to recognize that successful programs create new challenges. As productivity and income increase through fish farming, market prices for pond leasing may increase, and even areas technically under community ownership may become dominated by more powerful Bangladeshis. Thus, the more successful

³⁷ GM Akram Hossain & Md. Nurul Islam, *Small Scale Water Resources Development Sector Project in Rural Bangladesh: Perspective of People’s Participation*, available at http://www.iahr.org/e-library/beijing_proceedings/Theme_A/small%20scale%20water%20resources.html

³⁸ Asian Development Bank Operations Evaluation Department, *Project Performance Evaluation Report in Bangladesh* (2007), at <http://www.adb.org/Documents/PPERs/BAN/25312-BAN-PPER.pdf>

³⁹ Bestari et al., *supra* note 24, at 11-12.

⁴⁰ Asian Development Bank, *AN EVALUATION OF FRESHWATER RURAL AQUACULTURE DEVELOPMENT FOR POVERTY REDUCTION* (2005)

⁴¹ *Id.* at 15.

⁴² *Id.*

low-income farmers become at extracting income from such arrangements, the more onerous the conditions for their use of these resources is likely to become.⁴³

International development programs seeking to target the landless poor in Bangladesh must address each of these multiple challenges in order to produce lasting improvement in economic conditions, while also protecting the poor against the consequences of their own success. In the face of these difficulties, criticism of development program effectiveness is unsurprising. However, some efforts do appear to have produced targeted poverty reduction through cooperative approaches to freshwater pond aquaculture.

IV. Using Co-management to Fight Poverty: Grameen Bank

Provision of secure access to land and water can be considered a fundamental prerequisite to effective development programs targeted at the rural poor. Co-management provides one model for securing access to land. By joining the resources of landless communities, co-management can enable secure rights to share ponds and access to sufficient manpower and social capital to produce income for all.

Cooperative rights of access to land and water, however, cannot alone account for the success of projects. To the contrary, pond ownership in Bangladesh has become increasingly fractionated and in practice rarely leads to cooperative production. As one commentator concluded, “[j]oint ownership of ponds has generally been a disincentive to aquaculture since farmers are unwilling to invest in ponds when non-investing co-sharers will enjoy some of the profits. Ponds owned by a household or a group of people are often neglected Despite these problems, multiple ownership evidently does not in itself constitute an insurmountable barrier to aquaculture. Several NGOs . . . have formed groups with a dozen or more members around leased ponds, each of whom make [*sic*] equal contribution to inputs and gain a share [*sic*] the benefits.”⁴⁴ Such programs not only address issues of access but also consider the multiplicity of other issues, such as access to capital, that have hindered past projects.

The Joysagar Fisheries Project was likely the first development project to successfully use community-based approaches to specifically target the poor and landless. Funded by the quasi-NGO Grameen Bank beginning in 1986 and more recently administered by the Grameen Fisheries & Livestock Foundation (GMPF), founded in 1994, the project “developed a community-based model capable of mobilizing the landless poor to grow fish in underutilized freshwater ponds. Groups of landless people were guaranteed secure access to state-owned ponds, allowing specific tenure rights.”⁴⁵ By 1997, Grameen Bank worked with over 3000 groups of landless men and women, each with 5 or more members who were provided access to ponds and shared their harvests with the bank.⁴⁶ In addition, as of 2005, the project had restored 636 of 808 leased ponds for use by the landless. Of these, 432 ponds were excavated or re-excavated for culture, benefiting 4674 individuals with an average annual income of Tk5582

⁴³ David Lewis, *Rethinking Aquaculture for Resource-Poor Farmers: Perspectives from Bangladesh*, 22 FOOD POL. 533, 539-40 (1997).

⁴⁴ *Id.*

⁴⁵ *Id.* at 17.

⁴⁶ Lewis, *supra* note 44, at 537.

(US\$81), a dramatic increase from the average of Tk1700/individual at inception.⁴⁷ GMPF subsequently carried out a second project, the Dinajpur Fish Farm, along similar lines. In 1987, the Bank took control of 65 additional ponds, comprising 155 ha, which were previously under the control of the Department of Fisheries. As of 2005, 52 of those ponds had been brought under cultivation, benefiting 873 individuals, each of whom committed 54 working days to the project.⁴⁸

The GMPF approach was to use the resources of Grameen Bank to secure access to long-term pond leases and to provide the information, economic capital, and resources necessary to allow the landless participants to carry out successful aquaculture projects. This approach successfully considered each of the elements hindering poverty eradication in the sector.⁴⁹ Nonetheless, the Joysagar and Dinajpur projects met resistance in 2009, when the government of Bangladesh declined to extend the long-term leases to the Joysagar ponds “on the pretext that the ministry and departments concerned would take up those water bodies for productive activities through community-based organisations (CBOs).”⁵⁰ As a result, both of these projects appear likely to end by 2011.

Instead of continuing the leases, the Department of Fisheries will take responsibility for administering the ponds. Despite criticism from NGOs and the Grameen Bank, the government was quoted as saying that “The Department of Fisheries will come up with an elaborate plan by December [2009] making sure that community people can be part of these income generating activities as we take over in 2011.”⁵¹ The government, including the Department of Fisheries, has been engaged in a project supported by US AID to develop a national policy and laws to authorize and promote co-management of forests and fisheries in protected areas,⁵² but it is not clear if this effort will include the Joysagar ponds.

The ultimate fate of the Joysagar ponds and the success of the government in administering them is uncertain based on past experience.⁵³ Although a direct interaction between a CBO and DoF without an NGO intermediary can be seen to represent a full empowerment of local communities, few, if any, successful models of a Government-CBO system exist in

⁴⁷ Grameen Motsho O Pashusampad Foundation, Joysagar Fish Farm (JFF), at <http://www.gfish-livestock.com/ProjectsAquaculture/joysagar.html>. While the raw amount of income produced from aquaculture appears small, it is substantial when viewed in context. In 2005, per capita income in Bangladesh was \$463, and the beneficiaries of the Grameen Bank initiative can be assumed to earn well less than the average amount.

⁴⁸ Grameen Motsho O Pashusampad Foundation, Dinajpur Fish Farm, at <http://www.gfish-livestock.com/ProjectsAquaculture/dinajpur.html>.

⁴⁹ See M. Ahmed, A.D. Capistrano & M. Hossain, *Experience of Partnership Models for the Co-Management of Bangladesh Fisheries*, 4 FISHERIES MGMT. & ECOL. 233 (1997).

⁵⁰ Reaz Ahmad, *Clouds over fate of 60,000 rural poor: government decides not to extend leases of over 800 water bodies to a Grameen subsidiary*, DAILY STAR (Jan. 19, 2009), available at <http://www.thedailystar.net/story.php?nid=97589>.

⁵¹ Id.

⁵² Integrated Protected Area Co-management project, at http://www.usaid.gov/bd/programs/enviro_n_response.html

⁵³ See Parvin Sultana & Paul M. Thompson, *Community Based Fisheries Management and Fisher Livelihoods: Bangladesh Case Studies*, 35 HUMAN ECOL. 527 (2007).

Bangladesh.⁵⁴ As a result, the loss of secure access rights offered through the Grameen leases may portend a decrease in the ability of the landless poor to access the ponds.

V. *Challenges for Successful Co-Management*

If the cessation of Grameen Bank's long-term lease for the Joysagar Fish Farm is any indication, the Government of Bangladesh (GOB) appears to be adopting a new model for community-based aquaculture that is led by the government rather than NGOs. Given the 25 years of successful management of these farms and their potential as a model for other similar programs, this decision represents both a substantial risk to the success of existing co-management efforts and a potential model for the shape of future programs. Consideration of the challenges to successful implementation of government-led community-based aquaculture thus is necessary.

In taking responsibility from NGOs for promoting community management of aquaculture, the GOB is also effectively co-opting the poverty reduction missions of NGOs. Success in continuing poverty alleviation will require that government satisfy the needs of poor and landless groups identified above.

A. *Defining and Managing Community Based Organizations*

The GOB's move towards government-led aquaculture co-management reflects a larger trend in Bangladeshi environmental governance to use co-management schemes to govern resources allocation in contexts ranging from forests to wetlands. In fact, co-management of inland fisheries has a relatively long history in Bangladesh, dating to the 1970s.⁵⁵ Given the close connection between inland fisheries and freshwater pond aquaculture, the planned expansion of government-led aquaculture leasing is properly seen as an extension of these historical projects. In this sense, the DoF statement that it will implement productive aquaculture through "community-based organizations" is both predictable and sensible. What is less clear is exactly what types of arrangements fall within the definition of a CBO.

Many aquaculture resources in Bangladesh, such as ditches and village ponds, can be considered common property resources. However, "the reality in rural Bangladesh is that access to all [common property resources,] (such as waterbodies or forests) are in practice mediated by the local power structure, with intermediaries charging informal 'rents' to local users."⁵⁶ As such, DoF-identified CBOs may represent wholly distinct users groups than the stakeholders currently engaged in aquaculture activities. Substantial efforts will be needed to ensure that vulnerable users – such as the landless poor and women – are empowered rather than disenfranchised by this focus on CBOs. Legal reform to clarify the structure of CBOs thus will be needed to drive implementation of the new leasing program in order to avoid negative outcomes for the poor.

⁵⁴ M. Ahmed, A.D. Capistrano & M. Hossain, *Experience of Partnership Models for the Co-Management of Bangladesh Fisheries*, 4 FISHERIES MGMT. & ECOL. 233 (1997).

⁵⁵ Ahmed et al., *supra* note , at 237 ("Since the 1970s, the Department of Fisheries (DOF) has been arguing for an active government role in fisheries management and for revising the policy for management of publicly owned waterbodies along the principles of sustainable production and promoting the well-being of fishing communities.").

⁵⁶ Lewis, *supra* note 43, at 542.

B. *Security of Access to Land and Water*

Historically, leasing of public lands for fisheries activities were short term and intended to maximize production. These policies, as noted previously, led to increasing disenfranchisement of the poor in favor of entrenched and relatively wealthy landowners and users' groups. More recent innovations to lease lands directly to fishers have achieved mixed results. For example, the so-called Experiment in New and Improved Management of Fisheries sought to reduce rents by avoiding middlemen in favor of direct contracts with registered bona fide fishers.⁵⁷ Neither this project nor subsequent government-directed projects have successfully implemented such a system consistently, however.

Access issues are likely to re-emerge in Joysagar and elsewhere as the government institutes new leasing programs for aquaculture lands. The poor are likely to once again struggle to gain access without relying on middlemen or local power structures. Moreover, these issues are likely to be more pernicious in Joysagar than non-reclaimed areas, in fact, as the Joysagar ponds have consistently shown themselves to be profitable and have been the target of investment and maintenance over time. As a result, leasing values may be higher than for areas where projects have been less successful.

A second change in access between the Grameen and GOB-led models is the length of leases. Under the 25-year lease held by GMPF, ponds were revitalized and brought into service over a long time period as funds become available. The shorter lease terms traditionally offered by the government would provide disincentives to such activities, potentially slowing the pace of new ponds being brought into service and hastening the deterioration in the quality of others. Legal reform may be needed to promote longer-term leasing needed to provide incentives for longer-term leasing. In fact, the Department of Fisheries has proposed an amendment to the existing Ministry of Lands fisheries policy that would incorporate longer leases of at least ten years, which would represent a major improvement in lease term and would reduce access concerns.

C. *Institutional support for aquaculture development*

As noted previously, access to land is a necessary but not sufficient condition for successful aquaculture development. In addition to secure tenure, effective development strategies provide (i) access to information; (ii) access to human, social, and economic capital; (iii) access to infrastructure; (iv) access to development resources; (v) seasonality of aquaculture production; (vi) theft; and (vii) seed stock availability and quality.⁵⁸

As Lewis noted, "NGO approaches are generally multi-faceted and usually involve group formation, provision of credit, social development work (including consciousness raising, empowerment and raising rights awareness) in addition to basic technology transfer activities."⁵⁹ To maintain the success that NGO-led co-management efforts have achieved, DoF will need to replace these services via extension work.

⁵⁷ Ahmed et al, *supra* note 54.

⁵⁸ Asian Development Bank, *supra* note 40.

⁵⁹ Lewis, *supra* note 44, at 536.

Unfortunately, DoF extension services have been criticized due to a lack of capacity and inadequate consideration of poverty-related activity.

[T]he DoF is hampered by a severe lack of resources and a rigid, hierarchical institutional culture which inhibits proactive work. There are many practical difficulties faced by the DoF's extension staff known as Thana Fisheries Officers (TFOs). For example, TFOs usually lack effective means of transportation TFOs are also poorly trained, badly paid and many graduate from university training with little or no field experience. . . . The DoF's extension service therefore has a number of fundamental weaknesses.⁶⁰

These “fundamental weaknesses” described in 1997 include insufficient numbers of TFOs with inadequate incentives to engage in on-the-ground extension, a “production oriented, ‘top-down’ approach with little interest in poverty-focused work or opportunity for participatory problem solving with farmers,” and a lack of a strategy for provision of extension services.⁶¹ Numerous development projects have worked to improve these weaknesses since 1997, but the ability of DoF to provide sufficient extension services to users still may be questionable.

The difficulties in provision of extension services have contributed to failures of past government-led efforts to drive equitable development in the fisheries sector; as noted above, the Experiment in New and Improved Management of Fisheries successfully interfaced directly with fishers on a small scale. However, the project foundered in part due to an inability to provide secondary support for stakeholders. “DOF did not have the budget or skilled manpower to provide the necessary organizational support and motivational inputs as well as to ensure financial support from institutional sources. These supports were deemed necessary to win the fishermen’s confidence and to achieve an appropriate and desirable level of partnership with them. Particularly, DOF could not immediately put in place institutional support mechanisms to perform the useful functions (e.g. credit supply) and replace middlemen.”⁶²

The GOB, to its credit, recognized its shortcomings and in subsequent projects engaged in more direct collaboration with the NGO community to ensure that the necessary support and services would be available.⁶³ Similar efforts to engage the NGO community likely will be required to successfully implement government-led co-management of freshwater pond aquaculture.

VI. *The Way Forward*

Reversion of GMPF’s Joysagar lease to the GOB may signal a sea change in the government’s approach to aquaculture production on state lands. By taking on the implementation of leasing programs through CBOs, the GOB is effectively calling upon DoF to undertake a rapid and substantial expansion of its aquaculture programs. DoF’s ability to respond and to effectively administer a co-management system that works for vulnerable communities faces substantial hurdles, and the agency is unlikely to be successful without legal reform, investment in

⁶⁰ Lewis, *supra* note 43, at 536.

⁶¹ *Id.*

⁶² Ahmed et al., *supra* note 54, at 241-42.

⁶³ *Id.*, *see also* Pinkerton E. (1989) Introduction: attaining better fisheries management through co-management – prospects, problems, and propositions. In: E. Pinkerton (ed.) Cooperative Management of Local Fisheries: New Directions for Improved Management and Community Development. Vancouver, British Columbia: University of British Columbia Press, pp.3–33.

extension, and re-engagement with the NGO community. If GMPF's reaction to the decision to terminate the leases is any indication, however, DoF may struggle to retain support from NGO partners, potentially leaving existing users' groups without support. This worst-case scenario, however, can be avoided through careful work to clarify legal requirements for CBOs and access to leases and provision of sufficient incentives for the NGO community to continue support for aquaculture development, an area in which Bangladesh continues to have substantial room for development and profit.

GUYANA

I. Introduction

Guyana can be divided into coastal and interior regions. Most of the coastline is below sea level and is protected from the sea by a natural and manmade sea defense system erected by the Dutch in the 1800s. As a result of the elevation and large amounts of rainfall, water management and sea defense maintenance are crucial issues in Guyana. The coastal plain now provides the basis for Guyana's agricultural economy and is home to 90 percent of its population.

Guyana has historically depended on agriculture as its primary export and, more fundamentally, as the basis for its economy. Guyana's agricultural output was first centered on sugar cane and, more recently, on rice. These industries promoted development of a complex system of irrigation works that, in concert with the sea defense, provide the necessary water for crop production. Agricultural fields now occupy land that was originally mangrove swamp.⁶⁴ In recent years, downward pressure on commodity prices has negatively affected the economic stability of an economy based solely on the production of rice and sugar. As a result, in recent years, Guyana's government has shown increased interest in agricultural diversification – including aquaculture – both to stimulate economic development and to assist in food security for the nation's poor.

Until recently, Guyanese aquaculture was limited in scope and production methods.⁶⁵ Guyana has primarily focused on small-scale production of local species, including prawns and hussar, an armored catfish. After the 1950s, however, various entities have attempted to stimulate development of a more intensive aquaculture sector in Guyana. Nile and Mozambique tilapia were introduced beginning in the 1950s. These introductions were unsuccessful in stimulating the development of an economically sustainable aquaculture industry, but did leave a lasting legacy insofar as tilapia are now widely established throughout the coastal plain.⁶⁶

In recent years, farming of tilapia and other species has attracted renewed attention. As a result of government interest and support from USAID, through the Guyana Trade and Investment Service (GTIS), several commercial aquaculture production facilities are actively producing finfish in commercial quantities, including a limited amount of tilapia for export. The development strategy for Guyana has used a market-led approach, focusing on areas of potential profit to stimulate entry into the industry.

A cornerstone of the GTIS development strategy has been the creation of and support for a national trade association, the National Aquaculture Association of Guyana (NAAG). NAAG membership is open and ranges from the industrial-scale to small farmers and other members of the supply chain, all of whom are focused on aquaculture as an income source, not for subsistence purposes. Through NAAG, the aquaculture producers also interface with the

⁶⁴ Most of Guyana's mangroves were destroyed during the creation of the sea defense system and subsequent land drainage, but some mangrove areas remain, particularly away from the more urbanized Georgetown area.

⁶⁵ FAO maintains an independent assessment of the Guyanese aquaculture industry. See FAO, *Guyana National Aquaculture Sector Overview*, available at http://www.fao.org/fishery/countrysector/naso_guyana/en

⁶⁶ *Id.*

Government of Guyana to create an enabling legislative and institutional environment to support and ensure the economic, social, and environmental sustainability of the sector. Numerous regulatory hurdles remain, however, substantially hindering the effective management of the industry and limiting development of the sector.

This chapter introduces the characteristics of Guyana's aquaculture industry and examines the strengths and weaknesses of the industry's trade association-led structure as a model for community-based aquaculture development.

*II. Aquaculture in Guyana*⁶⁷

Currently, Guyanese aquaculture centers on four species groups: tilapia (including Mozambique, Nile, and Jamaican red), pacu (tambaqui/tambacu), armored catfish (hussar), and prawns (giant river prawn and salmon shrimp).⁶⁸ Hussar and prawns are considered local delicacies but are not considered to be well-suited to the export market. Pacu produced in Guyana is sourced from Brazil as fingerlings and is mainly intended for a domestic market. Pacu is a recognized species in the global aquaculture trade, however, and may eventually be produced for export. Finally, tilapia production is based on newly-imported broodstock, including "supermales".⁶⁹ Established local populations are not used as broodstock, as the evolution of these populations has rendered them unsuitable for commercial cultivation, according to local producers. Tilapia is the most prevalent fish in cultivation in Guyana and is primarily sold to the local market. In 2008, however, Guyanese producers exported approximately 25 tons of tilapia, a watershed in the Guyana aquaculture industry's commercial ambitions.

Aquaculture production in Guyana is primarily extensive (relying on natural fertilization in earthen ponds) and semi-intensive (including some interventions in the growth and breeding process, such as the use of commercial feeds).⁷⁰ Tilapia, pacu, and hussar production is primarily conducted in earthen ponds of up to 3 acres.⁷¹ These ponds are rarely aerated and are kept at a stocking density of approximately 4000 fish per acre. Feeding occurs using feed trays or hand-broadcast; no hormones, antibiotics, or parasiticides are currently known to be used in Guyana, although some more intensive activity may occur on a limited number of farms.⁷² In many cases, fish production is integrated with other agricultural commodity production,

⁶⁷ The majority of this section is derived from field observation.

⁶⁸ See also FAO, *Guyana National Aquaculture Sector Overview*, available at http://www.fao.org/fishery/countrysector/naso_guyana/en.

⁶⁹ Supermale fish exhibit a 'YY' genotype and therefore produce uniformly male (XY) offspring when mated to a female (XX) fish. The use of these fish eliminates reproduction during the grow-out cycle, producing significant increases in the efficiency and productivity of tilapia culture operations. A.G. Scott et al., *The 'YY' Supermale in Oreochromis niloticus (L.) and its Potential in Aquaculture*, 78 AQUACULTURE 237 (1989). These fish are produced via hormone manipulation. See generally Ronald M. Phelps, *Hormone Manipulation of Sex*, in TILAPIA: BIOLOGY, CULTURE, AND NUTRITION 211 (Lim & Webster, eds. 2006).

⁷⁰ FAO, *Guyana National Aquaculture Sector Overview*, available at http://www.fao.org/fishery/countrysector/naso_guyana/en.

⁷¹ A limited amount of river-based net pen production of tilapia may be occurring as well, but its extent is unknown. While consideration of net pen aquaculture is important and raises unique environmental issues, the SEA is likely to focus primarily on earthen and concrete ponds due to their prevalence and the dearth of available information on other operations.

⁷² In particular, the extent of use by New Line Aquaculture is unknown.

including rice, vegetables, and biodigestion (producing methane from duckweed). Guyana's producers use integrated aquaculture to beneficially use their nutrient-rich effluent water as fertilizer; some farmers also report increased health of crops associated with tilapia production.

A majority of the species used in Guyanese aquaculture are non-native and known to be invasive. All species of tilapia, as well as pacu and imported prawn seedstock are non-native. Tilapia are recognized invaders⁷³ and in fact have colonized large swathes of Guyana's coastline. While less studied, pacu are also a concern and have been prohibited from importation or targeted as a species of concern both in South America and worldwide.⁷⁴

Predation from reptiles, birds, and fish is another major environmental issue in fish farming operations. Currently, predator control is typically carried out through screening of water input and output pipes, netting against bird intrusion, and lethal control for both birds and large reptiles. Some producers have considered but have not yet implemented nonlethal techniques.

The inputs to these facilities include water, feed, and the fish themselves. Several producers operate hatcheries to provide broodstock for use by local producers. Fish for production are sourced from overseas as fingerlings (including supermales), and hatchery operators keep these imported fingerlings after growout to serve as broodstock for future cycles. Hatchery operations are currently fairly small in scale and fingerling availability remains an issue of concern to the industry.

Fish feed is produced locally from the byproducts of coconut, rice, millet, and barley production, with the addition of imported fishmeal. Feed formulation is an open area of study at the government-run Mon Repos aquaculture training facility. The industry will likely continue to rely at least in part on wild-sourced fish meal. As a result, tilapia farming will affect the sustainability of wild fish stocks for the foreseeable future. The feed, combined with current production practices, currently results in a feed conversion ratio (FCR)⁷⁵ of approximately 1.8 to 2.0, although precise determination is not available for any specific farm.

Water for finfish farming is provided through existing irrigation systems. These systems use canals from conservancies or rivers to provide supplies of fresh water. Water supply is generally gravity-fed, although pumping is sometimes required. In many farms – particularly where built over existing rice infrastructure – adequate water supply is not an issue; instead,

⁷³ Pullin, R.S.V., et al., *Environmental impacts of Tilapias*, in *TILAPIA AQUACULTURE: PROCEEDINGS OF THE FOURTH INTERNATIONAL SYMPOSIUM ON TILAPIA IN AQUACULTURE* (K. Fitzsimmons, ed. 1997).

⁷⁴ See e.g. H. Lopez-Rojas & A. Bonilla-Rivero, Introduction of Exotic Species and Transplantation of Native Species Across River Basins in Venezuela, in *Ecological and Genetic Implications of Aquaculture Activities 279* (Theresa M. Burt, ed. 2007); Network of Aquaculture Centres in Asia-Pacific, *The Way Forward: Building Capacity to Combat Impacts of Aquatic Invasive Species and Associated Trans-Boundary Pathogens in ASEAN Countries* (2005).

⁷⁵ FCR is a way of measuring an animal's efficiency in converting feed into body mass; a ratio of 1.0 indicates that for every unit of feed, the animal gains one unit of mass. Feed composition is one of many factors that may affect the FCR. The conversion of wild fish to farmed fish cannot be directly be determined from the FCR, but rather requires recourse to feed conversion efficiency (FCE), which directly estimates the amount of wild fish needed as feed input to produce a unit of farm-raised fish. See Marine Aquaculture Task Force, *SUSTAINABLE MARINE AQUACULTURE: FULFILLING THE PROMISE; MANAGING THE RISKS* 92 (2007).

flooding may be a concern. However, the timing of water delivery and water quality are important considerations. Rice and fish farming do not occur on the same cycles. As a result, disagreements may arise with farmers sharing a single canal as to when the canal should be opened and when closed. For example, a fish farmer may wish to drain a pond during the time when rice fields are to be dry; in this case, the fish farmer may not be able to release water until the rice is harvested. Similarly, upstream rice producers use pesticides on their crops, posing health and safety risks to fish producers. As a result, fish farmers may not be able to use canal water during spraying and must maintain reservoirs. Lack of available water may also be an issue during the dry season and flooding an issue during the wet. Flooding may result in escapes of fish, as ponds are not covered and fish escape when water overruns pond banks. This is a particularly challenging issue, as most producers are in the coastal plain and cannot release water through the sea defense when the tide is higher than the water level in the canal. Water quantity and quality are thus among the foremost challenges facing Guyana's aquaculture producers.

Shrimp farming is distinguishable from finfish farming operations in both physical plant structure and the inputs required. Shrimp production occurs on a small scale in Guyana. Producers operate either outside the sea defense (in the quarantine area) or they abut tidal rivers where salt water is available. In some cases, producers illegally breach the sea defense and operate inside it. In any case, shrimp producers maintain few or no permanent structures at their ponds and operate largely in an unregulated fashion. Shrimp production is based on wild broodstock.⁷⁶ In some cases, farmers acquire broodstock by breaching the defense to allow salt water to enter the pond, then closing the breach when the pond is full. The collected saltwater contains planktonic shrimp, which are allowed to mature in the pond and are then harvested. Because of the dearth of information on shrimp production, it is unclear how long an operator can produce shrimp in a given pond or what environmental impacts their operations may have on surrounding areas. However, given the experiences of the shrimp production industry in similarly-situated regions, such as Southeast Asia, effluent, predator control, salinization, and habitat destruction (mangrove) issues are almost certainly inherent to the industry. South Asian producers have recently evinced interest in beginning operations in Guyana on a more intensive scale. If this occurs, the environmental impact of shrimp production is likely to increase dramatically.

III. Institutional structure

A. NAAG

In recognition of the opportunities available in the aquaculture sector, and in response to declining catches in marine capture fisheries, the National Aquaculture Association of Guyana (NAAG) was formed in 2006.⁷⁷ NAAG is a public-private partnership that was established to facilitate the establishment and growth of a sustainable freshwater aquaculture industry in Guyana. With support from the Ministry of Agriculture's Department of Fisheries and international donors, including the United States Agency for International Development/Guyana

⁷⁶ According to FAO, some culture occurred from 2000-03 using imported giant river prawn seed stock. If continuing, this production would continue to rely on imported stock.

⁷⁷ See NAAG, *The National Aquaculture Association of Guyana*, at <http://www.aquaculture.org.gy/>.

Trade and Investment Support (USAID/GTIS)⁷⁸ and the British High Commission in Guyana,⁷⁹ NAAG has made significant progress in building the initial capacity of the sector to train fish farmers, pilot technologies, and form strategic relationships with investors, Government officials, and civil society. The group meets weekly and has expanded substantially since its inception.⁸⁰

To date, NAAG has commissioned market and commercial feasibility studies to support aquaculture development, including for organic production and the U.S. market.⁸¹ These studies indicated that organic tilapia farming is a niche market potentially suitable to Guyana's existing agricultural infrastructure, natural resources, and proximity to the U.S. market.⁸² NAAG is therefore exploring potential avenues for increasing the value of potential tilapia exports, including organic certification via a consultation with 8th Sea, an international organic seafood company, and certification under the forthcoming World Wildlife Fund-led Aquaculture Dialogues.⁸³ NAAG also provides training manuals for the four species of fish most commonly produced in Guyana, and access to basic training and tilapia seed production courses in aquaculture at the Mon Repos Freshwater Aquaculture Demonstration Farm and Training Centre, funded by the Ministry of Agriculture and associated with the Guyana School of Agriculture, which provides a Certificate program in Fisheries Studies.

B. Challenges and opportunities: The Trade Association Model

NAAG represents a significant development for Guyana's fledgling aquaculture industry. It includes a wide range of members from geographically disparate areas and stakeholder groups. In this sense, NAAG has successfully harnessed the community of established aquaculture players in the country. By aligning in a trade association, NAAG's members have obtained the benefits of information-sharing and training, allowing them to more quickly develop their operations into economic profitability and to increase the scale of their operations. Moreover, NAAG serves as an effective interface with the Guyanese government, the international donor community, international NGOs, and the private sector. Thus, NAAG has allowed Guyana's producers to participate in the development and certification debates at a level that belies the size and sophistication of the industry.

Although NAAG has been important to the development of Guyana's aquaculture industry, its structure and operation also present some challenges. First, NAAG is unapologetically market-oriented and does not focus on the creation or development of subsistence-level aquaculture – a common goal of development aid in the aquaculture arena. Similarly, its members are generally operators with sufficient capital and other resources to support ongoing, commercial-scale production; as a result, the group is not ideally suited to be (nor is it primarily intended to be) a poverty eradication mechanism. Third, NAAG has had limited success in attracting the support of small-scale shrimp farmers operating in rural areas, whose operations often exist in

⁷⁸ See Carana Corporation, at <http://www.gtisproject.com/>

⁷⁹ UK Foreign & Commonwealth Office, *UK in Guyana*, at <http://ukinguyana.fco.gov.uk/en>

⁸⁰ NAAG, *National Aquaculture Association of Guyana*, at http://www.aquaculture.org.gy/about_NAAG.html.

⁸¹ See NAAG, *Publications*, at <http://www.aquaculture.org.gy/publications.html>.

⁸² Economic Transformations Group, *FAST TRACK SECTOR DEVELOPMENT: COMMERCIAL AQUACULTURE ACTION PLAN (Draft Report 2005)*.

⁸³ See WWF, *Aquaculture: What we are doing*, at <http://www.worldwildlife.org/what/globalmarkets/aquaculture/whatwearedoing.html>

contravention of legal authority (see *infra*). As a result of these challenges, NAAG's benefits do not directly assist a majority of potential aquaculturists, absent indirect capacity-building.

IV. Legal structure

Guyana's regulatory structure is based on a British model, with a tripartite system of parliamentary legislation, agency-created regulations to implement that legislation, and common law to interpret the laws and regulations. To date, there are no laws that explicitly regulate aquaculture as such in Guyana. However, numerous laws and regulatory agencies govern aspects of the siting and operation of aquaculture production facilities.⁸⁴ An exhaustive description of the legal issues applicable to aquaculture production is beyond the scope of this chapter. Instead, this section focuses on the legal structures that apply to two key issues: land and water tenure and protection of the environment.

A. Access to Land and Water

Siting and access to water are crucial issues for the success of aquaculture facilities. In Guyana, these factors are subject to substantial constraints due to several factors. State lands are subject to a complex and obtuse system for leasing, and most citizens are unable to afford private land. Water is similarly subject to a balkanized and complex legal regime that can result in problems in the amount and timing of water availability for aquaculture, especially when exacerbated by flood events or the needs of competing user groups. Finally, although aquaculture production currently is not subject to specific regulation, a draft bill has been created to require permitting of these facilities. As a result, producers face considerable uncertainty with respect to the form and substance of future requirements for aquaculture facilities.

Land Tenure

Guyana's land tenure system is a legacy of both its colonial history and political system since independence. Agricultural lands are largely state-owned, while some lands are under privately title. However, high market prices for private lands and complex and archaic bureaucracy for public lands has led to high levels of unlawful occupancy and use of agricultural land by the rural poor who stand to benefit from aquaculture. As a result, industrial-scale aquaculture development has been limited to owners with access to capital and resources. Small-scale users, on the other hand, lack capital resources and suffer from disincentives to invest in aquaculture development.

Public lands comprise approximately 90% of Guyana, deriving primarily from "Crown Lands" owned by the England during the colonial period.⁸⁵ However, these lands are concentrated in inland areas; in coastal areas, the government controls roughly half of the available land. The Guyana Lands and Surveys Commission (LSC) is the agency charged with leasing state-owned

⁸⁴ See also FAO, *National Aquaculture Legislation Overview: Guyana*, available at http://www.fao.org/fishery/legalframework/nalo_guyana.

⁸⁵ Guyana National Development Strategy at 22.I (2001). The remaining public lands are Government Lands, which are those "purchased by, or granted to, the Government to be developed for general revenues, such as hospitals, schools, government administrative buildings, and land development schemes." *Id.* Government Lands thus are not relevant to most elements of aquaculture production.

lands for agricultural purposes and ensuring that those lands are beneficially used. LSC leases state lands for beneficial use by private entities under the State Lands Act. LSC leases agricultural lands primarily for use in small farms of 5-15 acres, a policy that similarly originated during the colonial period, when these lands were leased to former indentured servants and slaves.⁸⁶ Leases are currently issued for 25 years, but transfers or subleases are commonly reported to be unlawful.⁸⁷ If so, these leases are unsuitable collateral for bank loans, limiting the availability of state land for beneficial use by the poor. LSC is authorized to inspect leased lands and to reacquire them if it finds them to not be beneficially occupied or to have been subleased or transferred. This potential loss of tenure may limit investment in infrastructure on these lands.⁸⁸ However, due to the low cost-per-acre to lease state lands, land speculation is rampant. Speculators sublease these lands (in contravention of the law) to producers who put them into beneficial use. However, because they lack valid title and can be evicted at any time, these producers have disincentives to the development of these lands even assuming adequate access to capital. Unregularised occupancy of lands may also thrive because of the slow process of acquiring leases.

During the last decade, the LSC has received an increasing number of inquiries about leases for aquaculture development. These inquiries were initially treated as a form of the standard agriculture lease process, but LSC subsequently determined that aquaculture leases presented unique concerns and therefore developed an individualized lease for aquaculture properties. LSC issues these leases only after consultation with other agencies – including Sea Defence and EPA – and receiving no objections from these consultations. LSC itself issues leases only on lands that are suitable for the activity that the applicant desires to carry out. However, LSC cannot effectively determine appropriate lands for leasing because the government has neither enacted nor implemented any land use planning or zoning mechanisms. As a result, LSC, EPA, and other agencies necessarily take a case-by-case approach to leasing for each use. Moreover, multiple agencies lease state lands for different purposes without any central registry. Thus, the same parcel could be leased three times by separate departments for mining, forestry, and agriculture without any lessee being aware of conflicting leases held by others.

Land not owned by the state is privately owned under one of two land administration systems, both administered by the Deeds Registry. The “transport index” is based on Roman Dutch practice, while the British government introduced an “index of land transfer of title” in the 1950s.⁸⁹ Use and investment in freehold lands under both systems is limited due to the capacity of the Deeds Registry; prospective investors may not be able to determine with certainty the owner of a particular plot and thus may choose not to develop the land. As a result, much privately held land is not under beneficial use. Freehold land also may be too expensive for most

⁸⁶ *Id.*

⁸⁷ The National Development Strategy states, and other sources also report, that transfers or subleases are illegal. *Id.* at ch. 22. However, a prior report to USAID states that “[c]ontrary to many recent reports, lessors can use leased land legally for mortgage lending. An active sublease market thrives in Guyana. This has the benefit of providing access to the land for those without property while avoiding the risk of losing the property for non-use. The lease interest may also be inherited legally. Here, the lease descends to the heirs and assigns of the holder for the unexpired term.” Steven E. Hendrix, *Land Tenure in Guyana: A Rapid Appraisal Report with Recommendations on Policy Formulation and Registry Modernization for the A.I.D. P.L. 480 Program* (1993).

⁸⁸ National Development Strategy, at ch. 22.

⁸⁹ *Id.*

potential users due to limited supply and the large amount that is used for state sugar cultivation. GUYSUOCO, the state-owned sugar company, is the largest landowner in the country; approximately 1/3 of its 164,000 acres are held by the company. GUYSUOCO also controls most of the prime agricultural land in the country, but much of its leased and owned lands are not in cultivation yet are unavailable to other uses. The National Development Strategy therefore recommends return of these lands to the state to benefit other economic and social development programs, including aquaculture.⁹⁰ However, since that strategy was issued in 2000, little progress has occurred returning freehold land to the market.

Access to Water

Control of water is vital to Guyana's survival as a nation. As noted previously, the coastal strip that 90% of Guyana's people inhabit lies 1.5-3.5 feet below sea level and must be both protected from intrusion by the sea and from the buildup of drainage water from the interior. To prevent flooding and saltwater intrusion, water use and discharge are subject to a complex array of regulatory authorities. To consider the implications of water availability to aquaculture producers in Guyana, a brief consideration of the applicable regulators is necessary. They include, but are not limited to:

- Sea and River Defences Division (SRDD)
- National Drainage and Irrigation Authority (NDIA)
- Regional Democratic Councils (RDC)
- Neighborhood Democratic Councils (NDCs)
- National Water Council (Water and Sewerage)
- East Demerara Water Conservancy
- Guyana Sugar Company (GUYSUOCO)
- MM-Abary (MMA)
- Hydrometeorological Department (of MoA)
- Water Users Associations (WUA)

Of these entities, SRDD is unique. It is charged with protecting Guyana against flooding from the sea. To do so, SRDD maintains the seawall and other natural and artificial defenses against wave-induced erosion and overtopping of the defense. In some areas, the high water line is seaward (north) of the defense. In others, the wall itself represents the high water mark. SRDD has jurisdiction over any land seaward of the defense, plus land in the quarantine zone inside the defense, which extends almost to the first koker (sluice gate). SRDD holds permitting approval authority on these lands; thus, any aquaculture facility seaward of the wall (which includes shrimp farms) exists subject to SRDD approval, although many exist without any legal right. SRDD generally issues permits in these areas as long as the proposed activity does not threaten the integrity of the sea defense. Although aquaculture has resulted in the destruction of mangroves, mangroves technically are considered part of the defense and cannot be destroyed;⁹¹ the National Mangrove Policy also prohibits destruction of mangroves. SRDD can also prohibit development of lands within the quarantine zone. SRDD never permits private entities to breach

⁹⁰ *Id.* at ch. 9.

⁹¹ In many cases, mangroves were destroyed to create lands for agricultural production. *Id.* at ch. 5. This policy does not apply to such lands.

the seawall, although such breaches may nonetheless occur in outlying areas. Breach of a river defense may be permitted for construction of a canal, however: SRDD is less concerned about the integrity of river defenses due to the absence of wave action in river systems.

Ditches inland from SRDD jurisdiction may be controlled by any of a wide array of governmental and semi-autonomous bodies, including NDIA, RDCs, NDCs, GUYSUCO, and MMA. The owner of a particular canal depends on location and jurisdiction, making responsibility for particular kokers difficult to determine in some cases (and when breaches occur, this may hinder response). Water flows from rivers or conservancies – both the East Demerara and others controlled by the MMA or other entities – through agricultural areas and terminates at a sea or river outlet. Successful management of canal systems thus requires substantial interagency cooperation, a challenge during flood events. Moreover, users of the irrigation system and sea defense authorities may not be aligned in many cases; agricultural fields, including those for sugar and rice, and aquaculture facilities all require periods of flooding and fallowing, but these periods are not synchronized and may conflict with tides or rainfall events. As a result, aquaculture producers must interact not only with governmental authorities to assure adequate water supplies, but also must ensure that uses of water by other stakeholders do not interfere with production (whether in terms of quantity or quality).

The National Water Council (NWC), established under the Waters and Sewers Act (WSA), is responsible for maintaining water in the canals. The WSA establishes that all water in Guyana is public property and authorizes the NWC to oversee its distribution. Any well construction (to extract groundwater) requires a permit from NWC, as does any canal construction that would cause a significant impact on surface or ground water availability. Permits are only available to Guyanese citizens and to corporations that are majority-owned by Guyanese citizens. The permit requirement applies regardless of whether a canal or well is on public or private land.

Aquaculture farms require a good source of clean water from a primary canal, as well as access to water during dry periods. When farms are built on state lands, they must apply for a canal to be built from the primary canal to their lands. NDIA reviews applications for these canals. Farmers are not charged for the construction of these secondary canals, but pay a fee for the water to the relevant authority. Farmers on private lands generally may dig canals without government involvement, although the government may intervene to prevent adverse implications of new irrigation works on other users.

In practice, Guyana's drainage and irrigation works "have been reduced to a state of total disarray,"⁹² as evidenced by severe flooding in 2005 that resulted from overtopping of conservancies and inability of canals to carry sufficient water to drain the coastal plain, exacerbated by high tide. In addition, to the extent that aquaculture producers depend on water shared with producers of commodity crops, the needs of these primary agricultural crops are likely to drive water availability. As the National Development Strategy notes, "the interests of one group of water users, the sugar growers, tend to guide water-use decisions."⁹³ As a result, while water shortages may not pose serious threats to many Guyana aquaculturists, the difficulty

⁹² National Development Strategy at Ch. 15.

⁹³ *Id.*

or impossibility of controlling the timing and amount of water flows is likely to pose problems in the future.

Permitting

In addition to access to land and water necessary to carry out production, aquaculturists may face difficulties if they are required to obtain permits, as has been proposed. Aquaculture in Guyana is subject to oversight by the Ministry of Agriculture (“MoA” or “Ministry”) Department of Fisheries. However, while the aquaculture industry is within the MoA portfolio, the Ministry has little regulatory power over the industry because it lacks legislative authority in the area.

Parliament enacted a fisheries law in 2002, but failed to include aquaculture in the law except for section 33, which authorizes the Minister to create regulations on “the stocking of any water with fish and the establishment and control of fish hatcheries,” which has yet to be implemented. This has left a gap in the regulatory system. To remedy this shortcoming, a draft aquaculture bill was drafted in 2005, but it has not yet been considered or enacted by Parliament. The draft bill would require aquaculture producers to obtain a permit from and pay a fee to the MoA to operate an aquaculture facility. It is likely that the draft bill or similar legislation will be introduced in the future, but there are no imminent plans to introduce the bill.

In addition to potentially regulating aquaculture licensing, MoA has a variety of other authorities relevant to aquaculture production. Most notably, MoA controls animal health and animal import and export for domestic purposes. The applicable laws include provisions to ensure that only healthy, native animals are introduced into the country. However, these provisions exclude fish from the definition of “animal,” leaving open the question of whether the Ministry will attempt to regulate fish imports or exports in the absence of additional legislative authority.

Challenges and Opportunities: Land and Water Tenure

Land tenure and access to water are perhaps the most significant limitations to aquaculture development in Guyana. Most land is available only at high prices for private land or through a government lease via a complex bureaucratic process. This system for allocating government property provides incentives for land speculation, squatting, and other disincentives for aquaculture as a poverty eradication method. However, once land has been acquired, few legal restrictions limit how the land can be used, other than the beneficial use requirement for state lands and specific policies such as that applicable to mangrove destruction. Moreover, there is little enforcement of the few limitations on land use that do exist. As a result, the aquaculture industry has been able to experiment with and develop land use techniques, such as by varying impoundment size and arrangement, in order to maximize productivity. Finally, the proposed permitting system represents a threat to the aquaculture industry rather than an opportunity for development. The permitting program is divorced from any land use planning or other benefits to the aquaculture community, but would institute a tax program. As a result, in its proposed form the bill would not solve the issues related to land tenure, but rather would exacerbate them.

Even when land is available for use in aquaculture (or polyculture), water availability is largely subject to the whims of larger entities whose water needs may conflict with those of aquaculture producers, threatening productivity and in some cases demanding the construction of wells to provide groundwater access, a capital-intensive proposition. In addition, the balkanized and local control of conservancies and canal systems complicates water access. The country’s sea

defense needs provide another complication, and one that is unique to Guyana. The SRDD provisions complicate the creation of legally-justified and well-engineered shrimp farms, resulting in the proliferation of unsophisticated farms that illegally breach the defense.

In conclusion, Guyana's land and water allocation mechanisms are a morass of over-regulation and the absence of regulation, hindering the development or implementation of a national strategy for aquaculture development. In light of this regime, the market-based development strategy of supporting NAAG and developing large-scale aquaculture appears eminently reasonable, as more traditional poverty alleviation and subsistence strategies appear unlikely to be successful.

B. Environmental Laws

In addition to issues affecting the siting and resource availability of aquaculture production facilities, Guyana's aquaculturists also must address issues related to the quality of their resource, most notably including water quality and biodiversity. The Environmental Protection Agency (EPA) is the key regulator in Guyana for these issues.

Parliament created the EPA in the Environmental Protection Act of 1996 (EP Act). The EP Act provides EPA with authority to regulate many industries across a broad array of environmental impacts, including those on water quality and wildlife.⁹⁴ EPA also implements the Coastal Zone Management Act (CZMA), which allows the Agency to require consistent management throughout the coastal zone. EPA implements its authority both through consultation with other agencies on the environmental impacts of their decisions and via direct permitting of regulated industries through an Environmental Impact Assessment (EIA) process.

Water Quality

As a relatively new agency, EPA is continuing to develop its regulatory approaches to environmental issues affecting Guyana, notably those related to aquaculture. EPA initiated an environmental permitting process for aquaculture producers for which several producers applied.⁹⁵ EPA has issued a permit to New Line Aquaculture Farm, a large producer. However, after reviewing the permit applications and determining the large number of small farms in the country, EPA has suspended permitting to develop a unified strategy for such permitting – a process that is currently stalled. Once completed, EPA will develop a general permit to enable more efficient evaluation of the applications of small farms. Until completion of this process, however, aquaculture producers face uncertainty with respect to practices that may be required in the future.

From a practical perspective, legal uncertainties echo uncertainty that producers already must address regarding environmental quality – particularly with reference to water inputs. As noted previously, water reaches aquaculture facilities via the drainage and irrigation system, which means that water used in ponds and other facilities has generally been used in other agriculture and thus may be contaminated with any number of pollutants, ranging from animal waste to

⁹⁴ Its powers do not include toxics and pesticides, water quality, or full consideration of wildlife trade, however.

⁹⁵ EPA permitting is completely separate from the proposed aquaculture permitting process under the MoA discussed in the previous section.

chemical fertilizers and pesticides. Many aquaculturists lack the capacity or land to monitor or respond to changes in water quality; thus, they may depend on EPA and upstream users to effectively regulate water quality to avoid food safety issues or crop loss. NAAG may represent an important resource for aquaculturists for this reason, as the availability of a unified voice is likely to assist in negotiations with GUYSUCO or other, larger economic players.

Biodiversity

Various aspects of wildlife regulation in Guyana are allocated among a variety of agencies, including EPA, MoA (domestic animals), the Biodiversity Advisory Council, the Natural Resources Management Council, Scientific Authority, and the Wildlife Management Authority. The EP Act and Species Protection Act of 1999 provide legislative authority for the wildlife trade.

At least two wildlife issues are of potential concern for the aquaculture industry. First, the use of non-native species requires a permit to ensure that the species does not pose an invasion risk. This decision requires consultations with EPA, NRMC, and the Wildlife Management Agency, which makes the final decision. Compliance with this permit requirement for tilapia and other aquaculture species is uncertain; these species are currently under production, but have not been permitted pending EPA's development of a general permit for aquaculture.

Second, exports of ornamental fish are subject to control by EPA and inspected by the MoA. While the aquaculture industry is not currently engaged in the production of ornamental fish, the potential for that industry is significant and would expose aquaculturists to this oversight and implicate additional environmental impacts, such as those occurring during the acquisition of broodstock and feed.⁹⁶

Challenges and Opportunities: Environmental Laws

The development and success of the Guyanese aquaculture industry depends on how effectively key environmental issues are addressed. Substantively, producers face extremely serious uncertainties related to water quality, as few, if any, producers continuously monitor even basic water quality criteria, such as pH. While Guyana is relatively undeveloped, the preponderance of large-scale upstream agriculture suggest that, at a minimum, monitoring of water quality inputs and outputs can assist in the determination of the industry's environmental footprint. Additional concerns also apply with respect to the industry's reliance on nonnative, invasive species, the sustainability of its feedstocks, and its use of lethal methods to control predators.

These issues are likely to concern NAAG on several levels. First, EPA's ongoing development of environmental permitting standards for aquaculture production is likely to require some consideration of and investment in environmental improvement. Due to its lack of on-the-ground resources or enforcement capacity, EPA is likely to concentrate on large aquaculture facilities, including NAAG members, rather than facilities operating without official sanction. The agency's focus on group permitting, however, may enable NAAG to limit costs to members while focusing attention on key substantive areas to decrease environmental impacts in key areas. In addition, organic or ecological certification will require substantial investment in environmental monitoring and improvement, and such systems will require documentation of

⁹⁶ See previous section on environmental impacts for details on this issue.

environmental safeguards. To the extent that the industry's economic success requires such certification, environmental issues represent a serious impediment to the industry's commercial success.

V. The Way Forward

The legal and institutional governance of the Guyana aquaculture industry is limited in terms of both regulatory burdens and capacity. That is, the government of Guyana imposes few regulatory restrictions on the industry but also provides few services to it. This lack of governmental oversight and capacity can be construed as both a limiting and an enabling factor for the growth of the industry and its ability to engage in co-management.

Overall, the lack of oversight has eased the development of the industry, including in the adoption of novel techniques tailored to the existing geography, such as rice-fish aquaculture, that might otherwise be subject to scrutiny under environmental, food safety, or other laws. However, where regulatory restrictions do apply, the lack of enforcement has led to systemic noncompliance due to shrimp farm breaches of the sea wall, challenging the sustainability of the industry and hindering its development as an inclusive community. Similarly, these regulations and capacity inadequacies can frustrate even compliant producers; problems such as water availability and leasing of state lands are mired in bureaucracy and tilted towards historically powerful sectors, most notably including sugar production. Even if Guyana's producers are fully compliant with these legal authorities, the limitations on the ability of the state to adequately regulate other actors may complicate certification and export of aquaculture products, as Guyana's producers will be held to higher food safety, environmental, and other standards on the world market than they are at home. Thus, while limited government oversight and capacity have both benefits and harms, the industry as a whole could benefit from a more functional governance structure.

The development of NAAG can be seen as a necessary extension of the government's inability to provide extension services or support the growth of the industry. The trade association model attempts to bind together a geographically-disparate set of producers in a single group both to effectively advocate for necessary reforms in the legal structure and to share information and services to increase production. NAAG has successfully accomplished a number of these goals. However, it is important to remember the limitations of the trade association model, which is built upon industry development and marketing rather than on poverty eradication. In addition, NAAG's success rests upon continued support from international aid organizations; like many community-based management systems, the trade association model requires long-term investment and collaboration by industry, NGOs, and the government.

ITAIPU

I. Introduction

The Itaipu Reservoir occupies a 151 kilometer-long stretch of territory along the Parana River on the border of Brazil and Paraguay. The plan to develop the power plant was established under the Treaty of Itaipu in 1973. The resulting reservoir was formed in 1982 after the construction of the Itaipu Dam, the world's largest hydroelectric dam. As an international boundary, the Reservoir is under 60% Brazilian control and 40% Paraguayan control. Because the Reservoir serves as a natural border between Brazil and Paraguay, the waters are under federal domain and the dam managed by Itaipu Binacional, which is jointly owned by Paraguay and Brazil. Approximately 900,000 people inhabit the Brazilian portion of the basin.

The history of the Itaipu Dam and Reservoir is dominated by lack of transparency. In the 1950s, the Brazilian military government's preparatory discussions regarding the Itaipu Dam were held confidentially. Later, the actual project was designed and carried out entirely by the federal government as part of the First and Second National Development plans (1972-74 and 1975-79) without any input from state or local leaders or civil society.

The Reservoir was officially opened for fisheries in 1985. Prior to dam construction, the area had a long tradition of artisanal fishing of migratory species. The dam construction, however, blocked several migratory routes causing a significant decrease in available fish. Consequently, fishers began using less selective gillnets to maintain their yields, resulting in an increase in the types of species being exploited. This has led to over-exploitation and declining profitability from the fishery, threatening the livelihoods of many regional fishers.

Although fishermen organizations have existed in various forms since 1919, they have been subject to state control until recently. The state established and staffed the first fishermen colonies, precluding local participation in initial fisheries management.

Toward the end of the military regime in the mid-1980s, an increasing demand for social rights led to Fisheries Constitutional Movement. As a result of these demands, in 1988, fishermen associations were granted rural labor union status and the authority to define their own articles of incorporation. In 1989, the National Environment Institute (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis, IBAMA) was established under the Ministry of the Interior to manage and promote the development of natural resources in Brazil. IBAMA is now the enforcement agency within the Ministry of Environment. Previous attempts to manage the Itaipu fishery have focused primarily on technical assistance with little participation from the local fishers regarding project implementation, monitoring, or enforcement. Recently, through the creation of the Fisheries Special Secretariat (SEAP), the government has focused on fisheries as a means to achieve job creation, social inclusion, and environmental sustainability.

More recent laws and regulations reflect this attitude shift toward a more participatory approach to fisheries in Brazil. In 1999, law No. 9.795 identified as an objective providing incentives for "individual and collective participation in the preservation of environmental balance" through "humanist, holistic, democratic, and participative" principles. The following year, the National

Waters Agency (ANA) called for efforts to decentralize water management through the creation of national watershed committees that include stakeholders from civil society, the private sector, the government, and indigenous groups. While these regulations did not specifically call for natural resource co-management, they voiced principles underlying the basis of co-management systems.

II. Aquaculture in Itaipu

Currently, the Itaipu Reservoir contains 189 species of fish, of which 65 are caught professionally. The main species of catch are armando, barbado (catfish), and curvina. On average, the fishery produces 1,450 tons of fish per year, including professional and sport fishing. Itaipu Binacional, has run monitoring programs of professional fisheries since 1987 and sport fisheries since 2001 through partnerships with local universities.

In 2003, Itaipu Binacional revised its mission to include social and environmental responsibility along with generation of electricity. As part of this new broader mission it launched a new “Cultivating Good Water” program to improve the environment and social development of the Parana Basin. The objectives of the program included creating a Fishery Management Plan for Itaipu, continued monitoring of biodiversity and fish migration, improving fishing stations, and investigating the feasibility and capacity of implementing aquaculture co-management on the Reservoir. These goals were all developed by Itaipu Binacional to engage relevant communities, universities, local and federal governments, local fishermen. The company also changed its management of the reservoir to integrate social, economic, and environmental aspects and to emphasize public participation in the management of its programs.

In 2007, the Environmental Law Institute (ELI) initiated a project with Itaipu Binacional intended to provide technical resources and other assistance for local communities and the government to create a sustainable and participatory plan to manage aquaculture within the Itaipu Reservoir fishery. Because the interest in implementing aquaculture co-management came from the Brazil side, this case study only focuses on the obstacles to aquaculture co-management in Brazil.

In order to explore the possibility of aquaculture co-management within the Reservoir, Itaipu Binacional and ELI organized a workshop with pertinent stakeholders. The workshop provided a forum for participants to present their most important concerns, identify obstacles to aquaculture, and work together ultimately to implement aquaculture at the Reservoir. A total of 102 participants attended the workshop in February 2008. Of those participants, 53% were from federal, state, and municipal governments, 25% from the community, 15% from the private sector, and 7% from universities. The attendees from the community were mainly fishermen who represented all seven fishers’ colonies and two associations. Significant government agency absences included representatives from the Agriculture, Health, and Sanitation Department, the Education Department, and the Special Secretariat for Fishery and Aquaculture. Commercial aquaculture businesses, suppliers, financiers, the hotel and restaurant association, and fish leather producers made up the private sector segment. Notably, no non-fisher NGOs were present.

The workshop participants supported the establishment of an on-going forum of stakeholders to work towards establishment of co-management for aquaculture in the reservoir and solutions to the many impediments to a larger aquaculture sector identified during the workshop. Despite the efforts of Itaipu Binacional and the workshop participants, several factors have so far hindered the widespread adoption of aquaculture co-management in the Itaipu Reservoir. These causes, which ranged from legal to economic, will be discussed in the case study below.

III. Institutional Structure

A. Fishermen Colonies

A total of approximately one thousand fishermen use the Reservoir. Of those thousand, about 700 are professional fishermen and 300 are sporadic fishermen who also partake in “other activities.” Fishermen are organized through seven colonies and three associations. The colonies are considered fishermen’s labor union equivalents and thus must be organized in accordance with rules established by the Ministry of Labor but maintain autonomy from state control. The colonies also are subject to IBAMA regulations managing the fishery. Membership in a colony or association is not compulsory to be able to fish in the Reservoir, but membership in a colony is required in order to receive benefits accorded professional fishers, including minimum wage payments during the four month spawning season when fishing is prohibited.

B. Challenges and opportunities in institutional structure

Part of the challenge to co-management along the reservoir is the region’s lack of a long tradition of social organization. Broadly speaking, fisheries are not a significant industry in Brazil, and aquaculture is an even smaller, nascent subset. Furthermore, the Itaipu region does not have especially high activity within the fishing industry. As a result, development of fisheries- and aquaculture-related institutions has been slow.

The existing colonies and associations are not as institutionally embedded in Brazil’s legal framework in comparison to places like Lake Victoria, where membership in a fishermen organization is required to be able to even fish on the lake. Despite the fact that membership is not mandatory for access to resources, in practice, fishermen who are members of colonies have access to certain benefits in addition to the minimum wage payment. For example, Itaipu Binacional provided fish cleaning stations, fish pens, and other equipment at certain colonies.

Because colonies have legal standing, they are authorized to sue on behalf of their members in cases of non-compliance with natural and common rights. The Z-13 Fisherman Colony, established in 1969 and comprising 317 families, served as a plaintiff in civil public actions against Itaipu for the enforcement of National Water Policy (Politica Nacional de Recursos Hidricos PNRH) water management regulations, and against the Federal Roads Department for the impact on fisheries arising from navigational channel works.

IV. Legal Structure

In 2007 the national legislature passed a law regulating aquaculture and establishing two classes of aquaculture uses, one for industrial scale and the other for indigenous groups, poor displaced fishers, and other small-scale operations. Both types are required to obtain permits but the latter are not required to pay a license fee while industrial aquaculture operations must pay a fee. The attempt to create aquaculture in the Itaipu Reservoir was hindered due in part to a number of regulatory and legal hurdles. This case study does not attempt to provide an exhaustive list of the legal challenges that Itaipu faced, but instead focuses on a few key areas ranging from labor laws to food safety.

A. Administrative Impediments

The licensing process for aquaculture areas and parks involves an extremely bureaucratic process and several different regulatory agencies. Itaipu Binacional has obtained a license for experimental aquaculture in the reservoir, which currently covers all of the aquaculture efforts. A regular license for aquaculture requires an Environmental Impact Assessment (EIA) and Itaipu staff indicate it takes five years to obtain the license. The time, expertise, and expense required to meet the EIA and license requirements are prohibitive for individual aquaculturists, or the fisher associations. Even Itaipu Binacional is not convinced it would make sense for it to obtain a regular license. Fishing is not subject to licensing, but some related aspects, such as fishing points, are. In some areas, licensing fees are prohibitively high for individual fishers, although in Parana there is an exemption of fees for licenses in small areas under 10 square kilometers.

B. Food Safety

The Health and Sanitation Authority of Santa Terezinha de Itaipu (one of the municipalities in the basin) requires that each *abatedouro*, or the structure that houses the fish slaughtering, processing, and storage, obtain a “certification of slaughtering and production process and of premises” and adhere to certain sanitary conditions. In order to improve sanitary conditions, Itaipu Binacional financed the renovation of slaughtering facilities at fishing points. While this effort did improve slaughtering practices, the facilities still lacked sufficient refrigeration and did not meet minimum requirements for certification. Without additional funding to support the construction of proper abattoirs (a recurrent demand from the fishers), this problem presented a significant bottleneck for the proposed aquaculture operations. Itaipu Binacional was not prepared to provide the additional funding to further upgrade the facilities.

C. Labor Laws

Fishing is prohibited during spawning season, which occurs from November to February in Itaipu, though some artisanal fishing using low-impact equipment is permitted. The government provides professional fishermen with welfare payments equal to the national minimum wage during spawning season. In order to receive the subsidy, however, the fishermen may not receive supplementary income during the non-fishing months. Although this is a significant disincentive to fishermen seeking productive work during the off-season, many do engage in informal work. Doing so puts them in violation of the labor law, but is ignored by officials.

D. Opportunities and challenges in law

The legal and regulatory obstacles to implementing aquaculture co-management in the Itaipu Reservoir extend to many types of laws that are directly and indirectly related to aquaculture. One of the biggest challenges is the fact that the legal bottlenecks are so disparate. Among the challenges identified by several stakeholders at the 2008 workshop was the legal requirement for refrigeration at the fishing points in order to obtain certification of the slaughtering and production facilities. The expense of providing refrigeration was a key impediment to supplying the developing markets. The lack of certification means that the fishers are not eligible to supply the potential market, which precludes the development of that market. Another legal challenge identified by Itaipu Binacional was the license requirement to conduct an EIA, which is beyond the capacity of the individual operators of the aquaculture facilities. The license requirements seem designed only for industrial-scale facilities, not the small-scale operations being undertaken and envisioned for the reservoir. Additional challenges include that the national water code contains no provision for co-management of fisheries, leaving any policy without a legal foundation that would give it a degree of stability, and that the national environmental policy act does not include provisions for public participation in decisions, although regulations provide such opportunities.

V. *Economic*

A. Sustainability

Itaipu Binacional has been heavily subsidizing inputs by providing and replenishing supplies such as fry and food. No mechanism has been discussed to reduce fisher dependency on these subsidies.

B. Markets

Unlike Southeast Asia where high fish consumption provides natural local and regional markets for aquaculture harvests, Brazil's fish markets are not as extensive. A few different market options were identified, such as selling fish to local governments for use in school meals, or local hotels and restaurants. Expansion of these markets is hindered by the uncertainty of supply, which is due in part to some of the legal and administrative challenges identified above.

VI. *Ecological Impacts*

In order to preserve biodiversity and minimize potential ecological consequences, Itaipu Binacional staff wanted to use pacu, a native fish species, for aquaculture. Aquaculturists, however, argued for tilapia, contending that tilapia would appeal to wider, possibly international, markets. Itaipu so far has refused to supply tilapia fry because they think it is not native to the system. Some fishers dispute this and are attempting to collect evidence that tilapia were native to the basin before the dam was built.

VII. The Way Forward

The scattered types of obstacles that arose in Itaipu reveal the many different social, economic, and governance aspects that affect aquaculture. Because neither aquaculture nor strong community-level institutional structures are as deeply rooted in Brazil, the challenge will lie in coordinating and harmonizing these various factors to create an environment that minimizes economic risks and eases regulatory burdens of implementing aquaculture co-management.

LAKE VICTORIA

I. Introduction

As the second largest freshwater lake in the world, Lake Victoria is home to a thriving fishing industry rooted in traditional fishing communities. Lake Victoria falls in unequal proportion under the jurisdictions of Kenya (6%), Tanzania (51%), and Uganda (43%). Until the middle of the 20th century, the Lake was a highly diverse, multiple-species fishery exploited by artisanal fishers who caught a variety of native food fishes.⁹⁷ However, over the last 40 years, over-fishing, the introduction of non-native species, siltation from the erosion of deforested watersheds, destruction of wetlands, increased agricultural, industrial and municipal pollution, and other large-scale environmental changes have dramatically changed the social, economic, and ecological character of the Lake.⁹⁸

Perhaps more than any other single factor, the introduction of the Nile perch (*Lates niloticus*) in the 1950s fundamentally changed the character of the Lake. The perch was introduced in an effort to improve the declining fishery of the popular native species. Approximately 15-20 years after its introduction, the perch began to proliferate rapidly, resulting in the disappearance of many native species. Scientists estimate that 200 cichlid taxa have been lost and that many other biota, such as aquatic insects, crustaceans, and plant species, have likely been affected by the radically altered trophic structures in the Lake.⁹⁹ The Lake has been transformed from one of the most biodiverse in the world into a “three-species fishery,” dominated by the Nile perch, the Nile tilapia (*Oreochromis niloticus*), and the sardine-like *dagaa/omena/mukene* (*Rastrineobola argentea*). This lack of diversity presents major concerns for Lake Victoria’s ecological viability.

During the Nile perch boom, the perch market began to expand rapidly both within the East African Community (EAC) and internationally. An extremely profitable processing and trading industry developed around the Lake, attracting increasing numbers of fishers from outside the traditional lakeside fishing communities.¹⁰⁰ The number of fishers on the Lake is estimated to have quadrupled from 1980 to 2000 (from 30,000 to approximately 120,000).¹⁰¹ Lake Victoria is now the most important source of inland fishery production in Africa, dominated by a processing industry (with more than 35 processing plants having been built around the Lake) that is still supplied by a largely artisanal fishing fleet.¹⁰² The gross economic product in the lake basin is between US\$ 3-4 billion annually, and supports an estimated population of 30 million

⁹⁷ Balirwa *et al.*, *Biodiversity and Fishery Sustainability in the Lake Victoria Basin: An Unexpected Marriage?*, 53 BIOSCIENCE 8, p. 73.

⁹⁸ Odada *et al.*, *Mitigation of Environmental Problems in Lake Victoria, East Africa: Causal Chain and Policy Option Analyses*, 33 AMBIO 1-2 (Feb. 2004), p. 14.

⁹⁹ M. Ntiba, W. Kudoja and C. Mukasa, *Management Issues in the Lake Victoria Watershed*, 6 Lakes & Reservoirs: Research and Management 3, pp. 211-16.

¹⁰⁰ E. Jansen, R. Abila, and J. Owino, *Constraints and Opportunities for “Community Participation” in the Management of the Lake Victoria Fisheries*, IUCN Report No. 6 (June 1999) [hereinafter “IUCN Report 6”].

¹⁰¹ S. Heck *et al.*, *Cross-Border Fishing and Fish Trade on Lake Victoria*, IUCN/LVFO Fisheries Management Series Report No. 1 (2004), p. 5.

¹⁰² Neiland *et al.*, *Inland Fisheries in Africa: Key Issues and Future Investment Opportunities for Sustainable Development*, NEPAD Technical Review Paper (Aug. 2005).

people with incomes in the range of US \$90-270 per capita per annum.¹⁰³ The Lake catchment thus provides for the livelihood of about one third of the combined populations of the three countries, and about the same proportion of the combined gross domestic product.¹⁰⁴

The impacts of the Nile perch “boom” thus appear on the surface to have been economically beneficial, both at the national and the local levels. However, the broader overview of environmental and social change precipitated by the commercialization of the fishery and general development trends in the basin presents a much more complicated picture. In particular, several management challenges have emerged concerning the communities that continue to depend on the fishery for their food and livelihoods.

For example, with the commercialization of the Lake Victoria fishery, new stakeholders have emerged that have influenced the power structures and opportunities for lakeside communities. These include the processing and export factories that were established to take advantage of the emerging international markets for Nile perch (and increasingly for tilapia) and the increasing number of “outside” fishers seeking to take part in the profits but who are not connected with the established Lake-side fishing communities. Prior to the 1980s, the fishery was also dominated by owner-operated crafts. However, the profitability of the resource has attracted an increasing number of “absentee” boat owners, many of whom do not live on or near the landing sites from which their boats operate.¹⁰⁵

The gap between the richest and the poorest fishers at many beaches is thus widening.¹⁰⁶ Further, increased wealth has enabled fishers to use new and more efficient fishing techniques and gear, such as *tembea* fishing.¹⁰⁷ These changes, among others, have resulted in displacement of labor opportunities for many of the fishing community members. Moreover, the influence of the industry and its agents on prices has resulted in a loss of bargaining power by local fishing communities. The increased demand for raw materials has also put pressure on fishers to intensify their efforts (often resulting in the use of illegal gear and practices to maintain catch levels) and to catch smaller fish (which have not necessarily reached breeding age).¹⁰⁸ The use of illegal gear and practices in response to market demand and increased competition is exacerbated by a lack of enforcement capacity by the management institutions in the three riparian countries. As a result of these and related trends, fishers are reporting declining catches of Nile perch per unit effort and a Lake Victoria Fisheries Research Project (LVFRP) study in 2000 reported that overall stock of Nile perch between 1999 and 2000 declined by 30%.¹⁰⁹

Beyond the changing social, economic, and ecological character of the fishery, the Lake and its living resources are also being affected by a high rate of population growth (3-6% on average in the Basin) and the attendant increase in impact from urbanization and intensified land use

¹⁰³ LVFO, “The Strategic Vision for Lake Victoria Fisheries: 1999-2015,” available at www.lvfo.org [hereinafter LVFO Strategic Vision].

¹⁰⁴ *Id.*

¹⁰⁵ IUCN Report No. 6, *supra* n. 100 at 12.

¹⁰⁶ Lake Victoria Fisheries Research Project (LVFRP), Lake Victoria Fisheries Management Plan, Technical Report No. 16 (Nov. 2001) [hereinafter LVFRP Management Plan].

¹⁰⁷ *See id.* for description of this technique.

¹⁰⁸ *See id.*; *supra* note 101 at 8-9.

¹⁰⁹ LVFRP Management Plan, *supra* note 106.

practices. Agriculture is a major activity around the Lake. Combined with deforestation, agricultural practices are causing increasing levels of nutrient runoff into and consequent eutrophication of the Lake.¹¹⁰ Industrial and urban developments are also causing the release of new and higher levels of a variety of pollutants into the Lake. Moreover, increasing demand for land has led to the drainage of wetlands that perform vital functions for the fisheries ecosystem, including cleansing the water of pollutants, providing habitat for diverse species, preventing soil erosion and contributing to flood mitigation. Taken together, these trends threaten to undermine the integrity of the Lake ecosystem, the viability of its living resources, and the human populations that depend on those resources for their food and livelihood security.

II. Fisheries Management in Lake Victoria

As far back as 1947, the three member States of the East African Community (EAC) formally recognized their mutual interest in the living resources of Lake Victoria with the establishment of the Lake Victoria Fisheries Service.¹¹¹ After the Nile perch boom, governments became more involved in fisheries management and assumed the regulation of fishing activities. This marked a change from the clan-based management system previously in place. More recently, in 1994, the reconstituted EAC established the Lake Victoria Fisheries Organization (LVFO), an institution with the mandate to foster cooperation among the EAC States, harmonize national measures for the sustainable use of the living resources of the Lake, and develop and adopt conservation and management measures.¹¹²

During the 1990s, two major projects were established to contribute to the sustainable management of the Lake: the LVFRP, funded by the European Union, and the Lake Victoria Environmental Management Project (LVEMP), funded by the Global Environment Facility.¹¹³ The overall objective of the LVFRP has been to “generate scientific knowledge on the Lake’s fisheries in order to inform design options for a regional management approach.”¹¹⁴ As part of this work, the project developed a regional Fisheries Management Plan (FMP) in coordination with the three riparian states in 2001. LVEMP has several program areas, including fisheries management and fisheries research. Among the Project’s objectives are to “maximize the sustainable benefits to riparian communities from using resources within the basin to generate food, employment and income,” and “[t]o promote regional cooperation among the partner states.”

To coordinate the various initiatives dealing with management of the Lake and its Basin, the EAC established the Lake Victoria Development Programme (LVDP).¹¹⁵ Through the LVDP, the EAC member States are attempting to develop the region as a “regional economic growth zone,” as well as contribute to the sustainable management and conservation of the Lake’s aquatic resources, including its fisheries. In 2003, the three countries concluded the Protocol for

¹¹⁰ M. Ntiba, *Capacity Development in the Lake Victoria Basin*, available at <http://www.pollutionprobe.org/managing.shared.waters/victoria.pdf>.

¹¹¹ LVFRP Management Plan, *supra* n. 106.

¹¹² East African Community (EAC), Convention for the Establishment of the Lake Victoria Fisheries Organization, Art. II.2 (*signed* 30 June, 1994).

¹¹³ LVFRP Management Plan, *supra* n. 106.

¹¹⁴ Onefish website: http://www.onefish.org/cds_static/en/lake_victoria_research_en_80371_all_1.html.

¹¹⁵ EAC website: www.eac.int/lvdp/faq.

Sustainable Development of Lake Victoria Basin, which established the Lake Victoria Basin Commission.¹¹⁶ Among the various obligations and priorities established through these organizations and instruments, there has emerged a clear regional commitment to strengthen public participation in the planning and implementation of fisheries management.

Today, the primary regional bodies governing fisheries management are beach management units (BMUs). Tanzania was the first to adopt BMUs through LVEMP, and Uganda and Kenya both followed later. The BMUs operated initially in isolation and on other lakes, but eventually Uganda developed BMU guidelines and legislation to standardize organizational and financial management. At the end of 2006, 1087 BMUs had been established in total around Lake Victoria and all three partner countries adopted BMU guidelines based on the Ugandan model.

III. Institutional Structure

A. Beach Management Units

The establishment of BMUs provided the foundation and organizational structure to implement fisheries co-management on Lake Victoria.¹¹⁷ Historically, fisheries management was an activity integrated into the culture and traditions of local fishing communities. Community or clan leaders controlled the exploitation of these resources, including fish. This control extended to the landing beaches, which were owned by the clan. The local leaders regulated who could fish, the types of fish that could be exploited and gear that could be used, designated closed seasons, and determined the status of immigrant fishers in the local waters. As such, BMUs presented a departure from traditional systems.

Uganda spearheaded an effort to implement a more participatory management system in its new National Fisheries Policy in 2003. Co-management was a central component of this policy, elevating the responsibilities and involvement of local, previously disenfranchised people. With this new approach, BMUs became natural channels for vertical and horizontal cooperation and information sharing among various stakeholders.

A BMU is the most local unit of co-management in Lake Victoria. Each BMU elects members to serve on a Committee, and the Committees collectively comprise the BMU Assembly. Higher on the chain are the sub-county and district levels. On the government side, Fish Scouts and District Fisheries Officers supervise BMU activities and elections, and provide technical support. In Kenya, BMUs are registered with the Department of Social Services, under the Ministry of Culture and Social Service, but liaise primarily with the Department of Fisheries.

BMU functions include enforcing regulations regarding number of fishing vessels and type of fishing gear, maintaining the security and sanitation of beach facilities and implementing projects and conservation measures. While BMUs have the authority to deal with minor offenses, the fisheries officers or general police deal with larger punitive issues. Funding is

¹¹⁶ EAC, Protocol for Sustainable Development of Lake Victoria Basin, *signed* 29 November 2003.

¹¹⁷ Lake Victoria Fisheries Organisation, Inland Fisheries Co-Management in East Africa at <http://www.lvfo.org/downloads/Inland%20Fisheries%20Co-management%20in%20East%20Africa.pdf> (last visited Feb. 26, 2010).

variable among the three lakeside countries. Sources include individual donations, NGO, government, or international aid for development projects, fines from violators and offenders, permits, and fee collection from vessel or vehicle licensing. In Kenya, however, BMUs do not receive any government funding, and only receive a small portion of fees collected from licensing or offenses. Therefore, many Kenyan BMUs feel that better benefit-sharing or increased government funding could help their management capacities.

BMUs are legally recognized and empowered institutions, rather than informal associations. Only BMU members have the legal right to carry out fishing operations in the Lake. This is meant to help control the over-exploitation of lake resources. BMUs give entire fishing communities representation in state politics.

B. Community Development

Fisheries co-management also helps to implement community development objectives. For instance, in Uganda, various aspects of fisheries policy fall under the Poverty Eradication Action Plan, the Plan for Modernisation of Agriculture, and the government decentralization plan. Incorporating fisheries policy into other national initiatives helps to design co-management practices that fit in line with greater development goals. Around Lake Victoria, the progressive marginalization of communities in fisheries resource management has resulted in a loss of a sense of “ownership” of the resource. By empowering small-scale fishermen to compete with commercial operations, fisheries co-management can help local people to increase exports and improve livelihoods.

Specifically, and on a more micro-level, BMUs can provide platforms for more democratic representation within local communities. Elections determine leadership positions within BMUs. This allows traditionally underrepresented populations like women and the poor to hold leadership office alongside more influential community members. In fact, in Uganda, women must hold at least 30% of the seats of any given BMU Committee. Moreover, 30% must be boat owners, 30% must be members of fishing crews (traditionally some of the least represented members of society), and 30% is reserved for other stakeholders, while the remaining 10% is for fishmongers. While Kenya does not have such provisions for its BMU Committees, the organizational structure exists to accommodate wider community participation.

C. Challenges and Opportunities: the BMU model

The Lake Victoria BMU model can help to identify some key lessons in co-management. While it is important to bear in mind the differences between aquaculture and fisheries, many of the lessons learned from co-management in Lake Victoria can be applied to broader community-based management systems for both fisheries and aquaculture.

Although Uganda, Tanzania, and Kenya all border Lake Victoria, over one thousand BMUs exist as lakewide institutions in each country. This facilitates organizational consistency and regulatory harmonization for all three states. Kenya is the only country of the three that does not yet explicitly recognize BMUs as an official fisheries management institution, but if and when the Kenyan government moves forward with legislating BMUs, it will be able to align its

fisheries policies with Uganda and Tanzania given the existing cohesion in organizational framework.

The BMU structure also creates mechanisms for communities to communicate with the government, exchange technical and traditional knowledge, report and deal with offenses, and collect and record data. Lasting institutions are crucial for establishing and implementing long-term management and conservation plans. Moreover, the BMU Committees mobilize communities and facilitate cooperation across BMUs in various regions of the lake. This allows for consistent management practices throughout the entire ecosystem, systematic enforcement of rules, and experience sharing.

BMUs are nascent institutions but have already been shown in places to help empower communities. It is, however, still a challenge to find the balance between government and community involvement. BMUs were originally established through the government, and fish scouts still exerted a lot of influence over BMU activities, including BMU Committee election supervision. Additionally, the responsibilities of BMUs entail carrying out local-level work on behalf of the government. Because of these factors, some fishing villages do not see BMUs as truly equal partnerships, but rather as informal extensions of the Fisheries Department. Some BMU members, on the other hand, voiced complaints that they did not receive government funding to carry out work on behalf of the government.

IV. Legal Challenges

A. Regional Harmonization

As with many waterbodies, Lake Victoria falls under the jurisdiction of multiple countries, so the management of Lake Victoria necessarily requires regulatory cooperation among all of the lakeside countries to achieve shared objectives. The three countries are working to harmonize their fisheries policies, laws, regulations and standards to facilitate integrated and sustainable management of the Lake and its living resources. These commitments are articulated clearly in Chapter 19 of the EAC Treaty, in which the States agreed to “harmonize their policies and regulations for the sustainable and integrated management of shared natural resources and ecosystems,” and to “adopt community environmental management programmes.”¹¹⁸ More specifically, Article 114 of the Treaty commits the three countries to adopt common policies and regulations for the conservation, development and management of fisheries resources, as well as common fisheries management and investment guidelines for inland waters. Additionally, the EAC’s Memorandum of Understanding on Environmental Management provides for public involvement in environmental decision-making and harmonization of environmental laws among the EAC States.¹¹⁹

These commitments are largely a response to the failure of the centralized management structures to achieve the goals of sustainable resource use and management at the national level.

¹¹⁸ Treaty Establishing the East African Community, Ch. 19 (*entered into force* July 7, 2000), *available at* <http://www.eac.int/treaty.htm>.

¹¹⁹ Memorandum of Understanding between the Republic of Kenya and the United Republic of Tanzania and the Republic of Uganda for Cooperation on Environment Management, Oct. 22, 1998.

They also demonstrate the recognition that a transboundary resource requires cooperative and integrated management policies and regulations at progressively larger scales to achieve those goals effectively. Taken together with similar statements made in the Protocol for Sustainable Development of the Lake Victoria Basin and the LVFO Strategic Vision,¹²⁰ these commitments provide the legal basis for the emergence of harmonized fisheries co-management policies and regulations at the national and regional levels in the EAC.

LVFO serves as a regional forum for the three Lake Victorian countries to coordinate and develop management measures. Although LVFO was created through the EAC, it remains an autonomous arm of the EAC that maintains working relationships with various levels of governments, NGOs, the private sector, and other stakeholders working in Lake Victoria.

B. Legal Adaptiveness and Flexibility

The Kenyan National Fisheries Policy has not yet been enacted, but Uganda and Tanzania both recognize BMUs through their legislation. Tanzanian national policy, however, does not specify in its procedural guidelines the extent of BMU authority or delineate institutionalized mechanisms for the local government to cooperate with fisher folk. Instead, the national policy leaves structural and procedural details to be specified in separate regulations.

In Uganda, the 2003 BMU Rules provided the legal basis for BMUs, and a set of BMU Guidelines outline the organizational structure and authoritative parameters for BMU activities. The Guidelines were written with the intention of accommodating adaptive management and shifting management approaches. For instance, BMU Committees are allowed to develop and amend their own bylaws (so long as they are within the scope of existing laws). According to country's 2004 Fisheries Bill, Section 68, Sub-Section 1, two or more BMUs may form a BMU association as "an un-incorporated association for the purpose of developing and implementing a Fisheries Management Strategy in partnership with the local government." Similarly, two or more district councils may form Lake Management Organizations to coordinate integrated fisheries resource management. The allowance of these types of associations encourages collaborative regional planning and illustrates regulatory flexibility.

In Kenya, the Environmental Management and Co-Ordination Act (EMCA) of 1999 is the latest law that most directly addresses co-management. Various sections of the EMCA call for public participation in local communities, as well as protection of traditional community interests for residents living around riparian or forest communities. However, the Act does not discuss BMUs explicitly. The subsequent challenge for Kenya is that without any legislative recognition of BMUs, their authority must be derived from the "spirit" of relevant legislation. The institutionalization of BMUs as a model of co-management would allow BMUs in Kenya to

¹²⁰ See, e.g., Protocol for Sustainable Development of Lake Victoria Basin, Art. 3(1) (promoting public participation in planning and decision-making); Art. 6(2) (committing partner states to harmonization of laws and policies related to, *inter alia*, fisheries conservation); Art. 22 (committing partner States to create "an environment conducive for stakeholders' views to influence governmental decisions on project formulation and implementation"); and Art. 33(3) (designating the Lake Basin Commission as the entity responsible for encouraging public participation in the sustainable development of the Lakes natural resources and for harmonizing the relevant legal frameworks). See also *LVFO Strategic Vision* Para. 2 (committing to harmonization of national measures for the sustainable utilization of the living resources of the Lake); Para. 87 (recommending co-management to States as appropriate policy option).

more effectively cooperate with corresponding groups in Uganda and Tanzania to address lake-wide management.

C. Challenges and Opportunities

The legal aspect of fisheries development in Lake Victoria presents several important lessons in co-management. Part of the co-management success stems from the fact that BMUs have legal status as entities in Uganda and Tanzania. This increases BMU legitimacy within the two countries, and provides incentive and direction for Kenya to follow suit as it develops its own fisheries policies. Additionally, as illustrated in Uganda, the adaptive approach to fisheries policy can be very useful in adjusting appropriate role responsibilities between various government levels.

Because Kenya is still developing its fisheries laws, it has the benefit of looking to Uganda and Tanzania for examples of aspects that work well and those that do not. One thing for Kenya to take into consideration as it designs its policies is the distribution of power between central and local institutions. The Kenyan government has been trying to move away from such strong government-centered management and include BMUs in more decision-making so that local communities can have a greater stake in managing their fisheries resources.

V. The Way Forward

Lake Victoria's strength lies in the strong institutions involved in the co-management process. While Uganda, Tanzania, and Kenya are at three different stages of legal regulation of fisheries, they have the benefit of learning from each other and sharing experiences and best management practices through various organizational networks. This includes cooperation between and among governments and BMUs, as well as through the broader LVFO. The region is still developing its system of co-management, but new policies will hopefully remain consistent with wider-reaching goals of community, social, and political development.