RESEARCH PROGRAM ON Water, Land and Ecosystems

CGIAR

RESEARCH PROGRAM ON Fish

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Fish for whom?

Integrating the management of social complexities into technical investments for inclusive, multifunctional irrigation

Since the Green Revolution, irrigation in Southeast Asia (SEA) has mainly targeted rice production, reducing poverty and improving food security for many (Hussain and Biltonen 2001). However, rice alone is insufficient to meet human nutrition needs (Shekhar 2013). Moreover, the preferred investment approach has been to consolidate rice production into large-scale intensified operations (Vicol et al. 2018), which could disadvantage poor and other marginalized households by undermining other naturally occurring food systems at larger landscape scales. For example, inland capture fisheries are a vital source of nutrients and livelihood for millions (Conallin et al. 2019), yet fish habitat and migratory pathways are significantly degraded by water control and irrigation infrastructure.

Such trade-offs are incongruous with the United Nations Sustainable Development Goals (SDGs), which make clear that development spans both social and ecological dimensions, including no poverty; zero hunger; good health and well-being; gender equality; reduced inequalities (social), and clean water and sanitation; life below water and on land and climate action (ecological). Design and implementation of irrigation often fails to account for trade-offs in food systems, such as more rice but less fish, within multifunctional landscapes. Too often, limited attention is paid to social inequities that influence who shapes decisions over design, implementation and ultimately who benefits. For example, irrigation investments usually benefit those with large, commercially oriented landholdings, while the direct costs, such as depleted fisheries, are often borne by those without access to productive land. Attention to diverse livelihoods and social complexities, such as those found in Howarth et al. 2007, is needed to avoid such inequities.

Key messages

- Most interventions in the water sector remain technocratic and blind to trade-offs that undermine overall development outcomes. The relationship between irrigation and inland capture fisheries is a case in point, as irrigation infrastructure alters freshwater flows and blocks fish migration. As a result, the benefits of irrigation to mainly landed households could come at the expense of poorer households that depend on capture fisheries, which would only deepen their poverty.
- The SDGs, which span both human and ecosystem well-being, challenge us to shift development and investment aims from singular to multiple outcomes. This is possible if water sector interventions adopt more inclusive and integrated design approaches.
- Inclusive design approaches will help minimize cross-sector trade-offs and align technical interventions to the complex social contexts of plural interests, needs and vulnerabilities within beneficiary communities for more inclusive benefit flows.
- Adopting inclusive design approaches calls for going beyond numerical to qualitative and iterative processes of social engagement from intervention design through to implementation and evaluation.
- Ensuring that technical fixes achieve multiple and distributed development outcomes requires sufficient planning and financial support for inclusive institutions co-created by the stakeholders themselves, through iterative stages of analysis, reflection and design.

Broadening markers of success to include distributive considerations

In such cases, a double inequity occurs when poor and other marginalized households are excluded from land and/or irrigation access in a landscape, which has seen significant depletion of fisheries caused by water control infrastructure. Irrigation planning and investments need to consider who benefits as a matter of urgency, if vulnerable groups are to be supported.

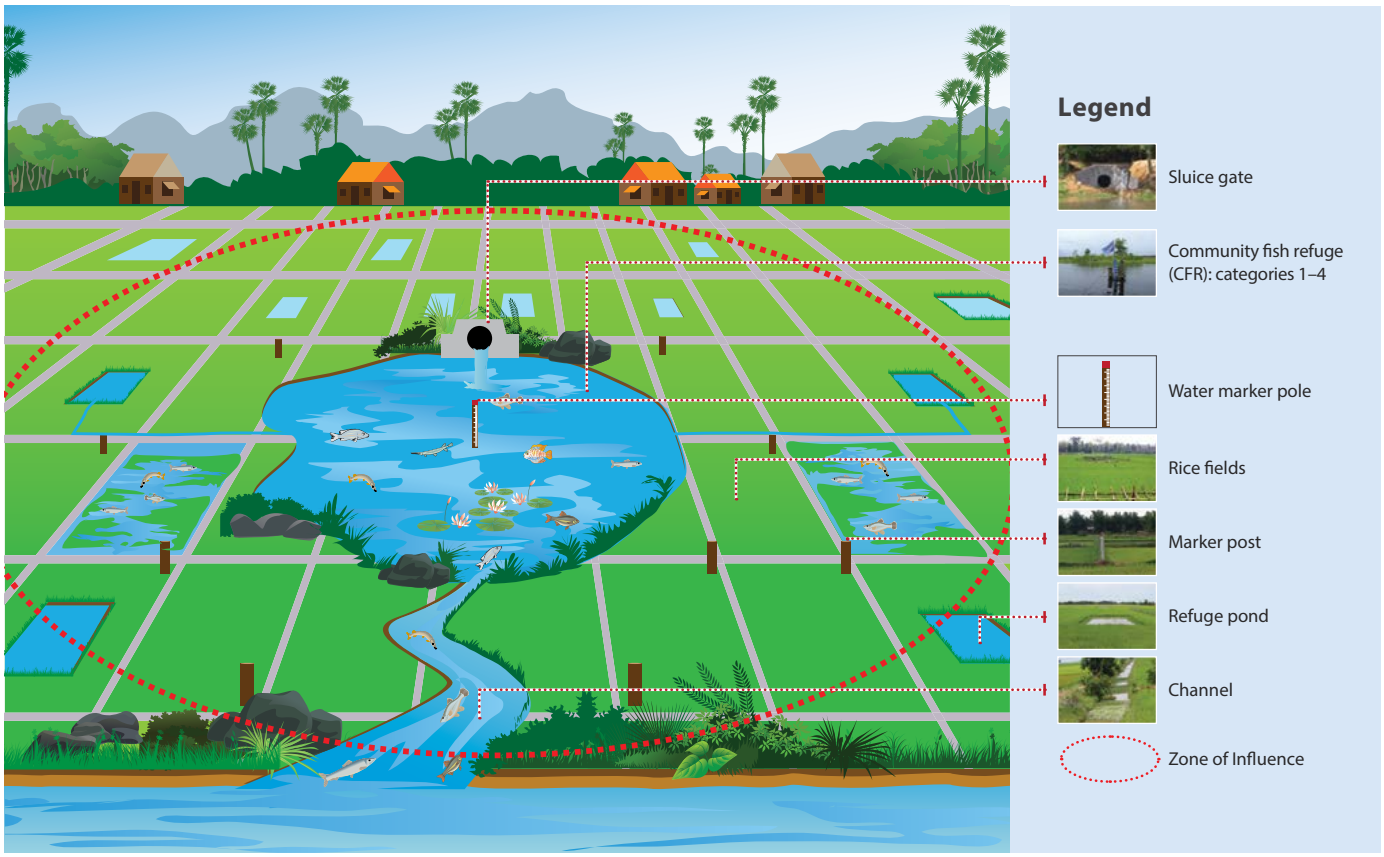
Several fish-friendly technical innovations exist that can help maintain the multifunctionality of irrigated landscapes. For example, fish passages, or fishways, may circumvent some negative effects of irrigation infrastructure, such as impeded fish migration, and help to maintain inland fisheries. While fishways can facilitate movement of fish up and down stream through regulated rivers, this in itself will not automatically translate into benefits for poor and other marginalized households, who must often compete for access in heterogeneous communities. Likewise, while aquaculture is an attractive proposition for increasing fish production, the substantial investments required often restrict entry for low income households. Arulingam et al. (in review), for example, confirm that in their study area in the Ayeyarwady Delta, youths from landless and small-scale fisher households believe aquaculture is beyond their reach. Conversely, dedicating only 15% of rice paddy land to fish rearing can increase productivity as much as 100% (Dubois et al. 2019) compared to cultivating rice alone. This is also a significant nutritional windfall, though this too relies on access to productive land and an enabling policy environment (Duncan et al. 2021).

The way forward: Understanding and managing complex social processes to bridge the techno-social divide

Achieving more equitable distribution of the costs and benefits of development investments is fundamentally about addressing the social context. It is not enough to assume simplistic binaries, such as men/women, rich/poor, fishers/farmers, nor to plan to remedy these through the collection of demographic statistics. Recognizing the complexities that shape people's access, use and rights around production assets and natural resources requires deeper investment in understanding wider social, cultural, political and economic contexts. Only with this understanding and commitment of investment resources can irrigation planning and investments, and indeed other technical development interventions, address the sources of inequality and optimize development outcomes in an inclusive and holistic manner.

Walking the talk: Institution building for inclusive community-managed fish refuges in Cambodia

An example of this deeper work can be found in the Rice Field Fisheries Enhancement Project (2012–2016), led by WorldFish. The flood-pulse in Cambodia enables rice-field fisheries to provide 30% of Cambodia's inland fisheries catch. A key aspect of rice-field fisheries is community fish refuges (CFRs), which are community-managed water bodies among seasonally inundated rice fields (Brooks et al. 2015) (Figure 1). These CFRs are categorized into four types: irrigated reservoirs, non-flood prone areas, flood prone areas, and within natural waterbodies



Source: reproduced from WorldFish 2019.

Figure 1. CFR components.

(type 1, 2, 3 and 4, respectively). All CFRs are linked to irrigation infrastructure either directly (type 1) or indirectly (types 2, 3 and 4). They also provide perennial habitat, allowing fish to remain within the rice agroecosystem during the dry season, which supports local fish populations that spread across the rice fields with the onset of floods. Cambodia's Fisheries Administration has designated CFRs to enhance the productivity of rice-field fisheries, and investments have been made to develop and scale best management practices to enhance local fishery productivity, reduce poverty and improve nutrition through greater access to fish.

Seeing local communities as both the custodians and beneficiaries of well-managed CFRs underpinned a systemic (Ison and Straw 2020) and iterative approach of building inclusive organizations (the CFR governing committee), actor networks and partnerships, as well as discussion forums for planning, reflection and learning. Governance capacity-building for CFR committees focused on five areas: appropriate institutional structure, inclusive planning and implementation, effective resource mobilization, networking with external stakeholders and equitable representation (de Silva et al. 2017). Local resource users, commune council members, fisheries officers, environment officers, military police, district officials and regional governors were all engaged through sharing responsibilities and recognition for achievements and helping to improve equitable participation and decision-making, thereby limiting power imbalances and the potential for governance traps (Suhardiman et al. 2017).

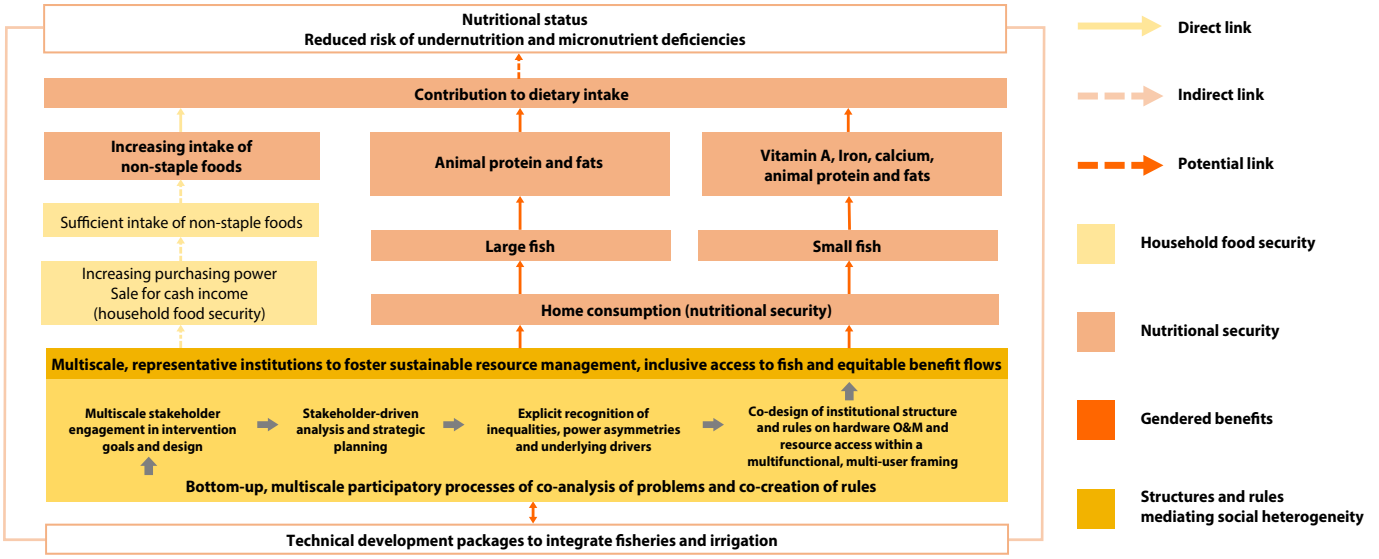
This process of institutional co-creation has yielded promising results. Resource conflicts have decreased through negotiated and agreed upon limits to water exploitation in the CFRs and better coordination between water users (de Silva et al. 2017). In the second year of one project, fish production increased 17%, worth USD 1.8–2.1 million (Brooks and Sieu 2016). Another study found that households were catching 800 g more fish per day, while the variability of catch among households reduced (Phala et al. 2019), suggesting CFRs contribute to income equalization among community members. Household savings and family expenditures had consequently increased significantly.

This example demonstrates several benefits of investing in and building collective local resource governance capacity. This includes enriching problem definition and analysis, and promoting a context-relevant governance that mediates between the needs of diverse stakeholders. Key to achieving these benefits was the bottom-up process for co-creating management, where the project was the facilitator rather than the agenda and rule setter. Combined with a participatory process that was conscious of actors at different scales, the CFR governance process appears to have mostly overcome the challenges of access and benefit distribution common to many rural development investments.

Takeaways

Inclusive development will require understanding local social circumstances through which relevant and locally accepted institutions can be built through iterative social engagement, beginning in the goal setting phase. Investment in "multiscale, representative institutions" developed through bottom-up participatory and iterative processes (Figure 2) can achieve multiple SDGs while minimizing trade-offs—in contrast to external, top-down approaches. Key steps in such a process can include multistakeholder analysis of the status quo, including explicitly acknowledging root causes of inequalities and power asymmetry.

Water control infrastructure already influences the well-being of millions. It has the potential to be enhanced for more effective, multifunctional benefits for diverse stakeholders, including those who are the focus of SDGs 1, 2, 3 and beyond. We call for reconceptualizing water infrastructure planning and management to be more holistic, to incorporate the social, ecological and equitable considerations required to deliver on the SDGs. The political will to make sustainable, positive impacts in the lives of rural smallholders and the landless is necessary for participatory, locally appropriate and effective solutions. The onus is on donors and governments to recognize and invest in the intertwined ecological and social outcomes when planning, designing and implementing development programs to ensure that benefits are distributed more equitably for those they are seeking to uplift.



Source: adapted from Lynch et al. 2019.

Figure 2. Development process components necessary to promote inclusive growth.

References

Arulingam I, de Silva S, Senaratna Sellamuttu S and Palal M. (In review). Youth livelihood aspirations and realities: What role for fisheries? A case-study of Kyonkadun Village, Ayeyarwady Delta, Myanmar.

Brooks A, Kim M, Sieu C, Sean V and Try V. 2015. A characterization of community fish refuge typologies in rice field fisheries ecosystems. Penang, Malaysia: WorldFish. Handbook: 2015-37. https://hdl.handle.net/20.500.12348/488

Brooks A and Sieu C. 2016. The potential of community fish refuges (CFRs) in rice field agro-ecosystems for improving food and nutrition security in the Tonle Sap region. Penang, Malaysia: WorldFish. Program Report: 2016-10. https://hdl.handle.net/20.500.12348/85

Conallin JC, Baumgartner LJ, Lunn Z, Akester M, Win N, Tun NN, Nyunt MMM, Swe AM, Chan N and Cowx IG. 2019. Migratory fishes in Myanmar rivers and wetlands: Challenges for sustainable development between irrigation water control infrastructure and sustainable inland capture fisheries. *Marine and Freshwater Research* 70(9):1241–53. doi: 10.1071/MF19180

Dubois MJ, Akester M, Leemans K, Teoh SJ, Stuart A, Thant AM, San SS, Shein N, Leh M, Moet PM and Radanielson AM. 2019. Integrating fish into irrigation infrastructure projects in Myanmar: Rice-fish what if…?. *Marine and Freshwater Research* 70(9):1229–40. doi: 10.1071/MF19182

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Hussain I and Biltonen E. 2001. Irrigation against rural poverty: Workshop proceedings. International Water Management Institute. https://ideas.repec.org/p/ags/iwmicp/118406.html

Ison R and Straw E. 2020. *The Hidden Power of Systems Thinking: Governance in a Climate Emergency*. Routledge.

Lynch A et al. 2019. Speaking the same language: Can the sustainable development goals translate the needs of inland fisheries into irrigation decisions? *Marine and Freshwater Research* 70(9). doi: 10.1071/mf19176. Copyright 2019 by CSIRO. Adapted with permission.

Phala C, Sarin T, Suvedi M and Ghimire R. 2019. Assessment of community fish refuge management practice in the Siem Reap province of Cambodia. *Environments* 6(1). doi: 10.3390/environments6010001

Shekhar C. 2013. Hidden hunger: Addressing micronutrient deficiencies using improved crop varieties. *Chemistry and Biology* 20(11): 1305–06. doi: 10.1016/j.chembiol.2013.11.003

Suhardiman D, Lebel L, Nicol A and Wong T. 2017. Power and politics in water governance: Revisiting the role of collective action in the commons. *In* Suhardiman D, Nicol A and Mapedza E, eds. *Water Governance and Collective Action*. Routledge. 9–20.

Vicol M, Pritchard B and Htay YY. 2018. Rethinking the role of agriculture as a driver of social and economic transformation in Southeast Asia's upland regions: The view from Chin State, Myanmar. *Land Use Policy* 72: 451–60. doi: 10.1016/j.landusepol.2018.01.009

WorldFish. 2019. Guidelines for community fish refuge: Rice field fisheries system in Cambodia. Penang, Malaysia: WorldFish. https://digitalarchive.worldfishcenter.org/handle/20.500.12348/3632

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