

# Integrating rice, fish, irrigation and water storage: towards greater sustainability

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# Why are fish important?



Inland Fisheries globally support the nutrition and livelihood security of many millions of people

- 43% of global inland fish catch originates in low-income-food deficit countries
- Vital source of protein and minerals, micro-nutrients
  - Inland fish tend to be more affordable than other animal source foods in remote areas with impoverished populations
  - Protein equates to full dietary consumption of at least 158 million people
  - **90% of IFs are used for direct local human consumption**
- Formal employment 17 million fishers and 8 million post-harvest workers, but many millions of others include fisheries as a component of their livelihood.
- Women play a substantial but often invisible role in inland fisheries. They tend to be more heavily involved in the post-harvest sector.

 In the lower Mekong basin, women are the main traders in the estimated 5,000–6,000 fish markets



Tonnes of inland fish production in LIFDCs (Funge-Smith 2018)

Global annual value: USD **19 billion** 

# **Traditional rice-fish systems**

Ricefields important source of biodiversity >230 species of fish, insects, crustaceans, molluscs, reptiles, amphibians ...and plants (in addition to rice)

Widely used by local communities to supplement diets

In Laos a wide range of species are caught and consumed - 60-125 kg/ha – in traditional systems that have low agrochemical inputs.



# Why is irrigation important?



Irrigated agriculture (275 million ha)

- Critical component of the Green Revolution
- About 21% of cultivated land contributes approximately 40% of total crops produced
- About 70% of irrigated areas are in Asia (China and India account for 45% of this) L. America: 14%; Africa: 6%

#### Irrigation has been and continues to be a significant contributor to socioeconomic development :

- Food security
- Poverty reduction
- Income generation
- Environmental Protection (intensify production land sparing)
- Climate Change Adaptation





## Impacts of irrigation on fisheries





Thousands of barriers to migration in the Lower Mekong (Marsden et al, 2014)

Trade-off – intensifying rice production



Most water infrastructure adversely impacts fish by:

- disrupting longitudinal and lateral connectivity of rivers
- modifying the quantity, timing and quality of river flows
- physically damaging fish (e.g. passage through gates etc)

Agrochemicals – pollute water leading to:

- mortality
- impacts on metabolism, reproduction etc.

#### **Integrating fisheries into the design and** management of irrigation systems





#### Objectives

- Increase food and nutritional security of local communities
- Increase water productivity
- Generate more income per hectare
- Reduce the need for agrochemicals
- Increase the resilience of communities

### **Options to integrate fisheries and irrigation**



Pak Bueng



- Grills on intakes to stop fish being sucked into pumps
- Opportunities for culture fisheries in ponds and canals



Boys et al., 2016



### **Reservoir fisheries**





If managed correctly reservoirs can provide opportunity for significant fisheries:

Kariba:	up to 35,000 ty <sup>-1</sup>
Cahora Bassa:	up to 15,000 ty <sup>-1</sup>
Lake Nasser:	20,000 to 55,000 ty <sup>-1</sup>
Volta:	40,000 to 80,000 ty <sup>-1</sup>



Relationship between yield per unit area and reservoir area in the LMB (Hortle, 2015)

#### **Ecosystem based management options to** enhance reservoir fisheries



Current	Promising	
Vegetation clearance before reservoir filling (water quality management)	Conserving shoreline vegetation/Building reservoir wetlands to enhance fish habitat	Creating habitat for fish on the drawdown zone
Stocking reservoir with fingerlings	Creating fish conservation zones within the reservoir and upstream tributaries	Objective: Increased diversity of habitat
Management of point source pollution in the reservoir catchment	PES to encourage upstream catchment management to enhance reservoir ecosystem	Refuges for fish Increased productivity
Maintenance of minimum downstream flow requirements	Release regime that mimics natural variability, including flood flows	Improved livelihoods
Sediment flushing	Minimize large rapid water-level fluctuations	
Building fish ladders	Building fish passage that mimics natural stream and maintains u/s and d/s connectivity	

## **Fish friendly irrigation**



Food and Agriculture Organization of the United Nations INAN Water tanagement institute

Increasing the benefits and sustainability of irrigation through the integration of fisheries A GUIDE FOR WATER PLANNERS, MANAGERS AND ENGINEERS



Guidelines: integration of fisheries in irrigation







fisheries/aquaculture – in irrigation

production, nutritional, livelihood and

investments can increase fish

Better integration of

economic benefits.

#### Why are fisheries still (largely) ignored?

- Lack of awareness
- Lack of data and information
- Lack of capacity
- Not considered economically important
- Fisheries are affected by many other things
- Widespread belief that aquaculture is THE solution



#### Take home message



Inland fisheries are often invisible, but vitally important to some of the worlds most vulnerable people.

Critical that inland fisheries are better integrated with water resource management in particular in rice systems, irrigation and reservoirs





# **Thank You!**