

Assessment of the Potential of MUS systems in the Eastern Gangetic Basin

Duration of the Project: 1 year

Project Team:

ICAR Research Complex for Eastern Region, Patna

1. Dr. M.A. Khan, (Hydrology & Water Resources Engineering)
Director
Email: makhanicar@yahoo.com
2. Dr. Abdul Haris A.
Sr. Scientist (Agronomy)
Email: abdulharis123@rediffmail.com

International Water Management Institute, New Delhi

1. Bharat R Sharma
Senior Researcher-I & Head
Email: b.Sharma@cgiar.org

Location : **Eastern Gangetic Basin**

Water Use Systems

- Water use systems in rural and peri-urban areas mainly includes
 - Irrigation system or sub-system level productive uses
 - Water harvesting system's level productive uses
 - Small scale productive uses at household level
- Multiple uses of water provide challenging opportunities for increasing water productivity and livelihood at various scales.

MUS Definition

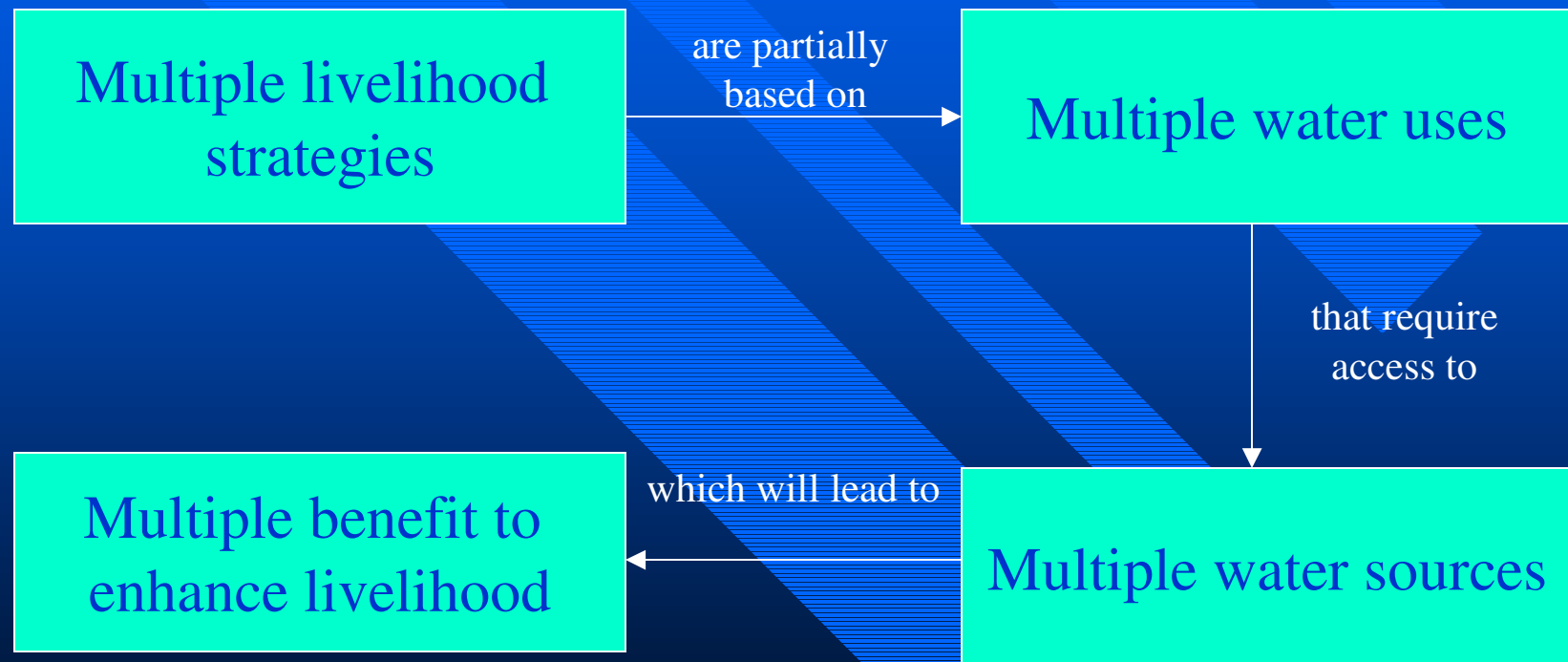
The sum of the institutions, services, resources, and infrastructure that allow a community to manage its water resources and the domestic and productive uses of water effectively and inclusively. A full multiple-use system is the result of integrated planning and interactive design.

Multiple Uses of Water

- Enhancing water productivity
- Increasing farm productivity without any additional demands of water
- Enabling diversification to high value outputs
- Reducing risk, better use of resources, and increased resource use efficiency
- Ensuring increased income and better flow of income throughout the year
- Enabling better utilization of otherwise wasted/depleted water resources, water congested/waterlogged areas
- Providing nutritional security in rural areas

Conventional Irrigation Systems, water harvesting and water supply systems ignore or lack multiple use approach.

Multiple Water Use- Livelihood



Multiple Irrigation Water use for improving Water Productivity and Livelihood

- Integration of fisheries, livestock and other aquatic resources into the existing irrigation and water use systems—improvement of irrigation water productivity
- Integration of secondary reservoir or small tanks in the canal or tubewell based irrigation system by raising fish in these reservoirs by an integrated farming system approach. “Melons-on-the-Vine system”
- The perception of irrigation water has to be changed from being water to sustain agricultural production, to water that sustains the livelihood of people living in irrigation schemes.

Goal

- Assessment of productive utilization of poorly used water and land resources mainly due to seasonal water logging and enhancing overall productivity of irrigation water or harvested rainwater in rainfed eco-system for livelihood improvement and nutritional security in the eastern gangetic basin through Multiple Water use production systems.

Objectives:

1. Review the state of the art and document the multiple uses of water for enhancing water productivity and livelihood improvement in rural areas.
2. Assessment of multiple uses options/systems under seasonal waterlogged conditions of eastern region, canal or tubewell commands, and harvested rainwater in the eastern plateau.
3. Analysis of socio-economic-infrastructural constraint in wider adoption of multiple use strategies and possible remedial measures

Activities

1. Review (based on literature, exposure visits, direct communications and contacts, etc) of existing options of multiple uses under difference scenarios.
2. Desk based assessment for applicability, and documentation of multiple water use for practitioners.
3. Establishing an exhaustive network of people and institutions involved in promoting multiple use systems and practices in the eastern gangetic basin.
4. Classification of the multiple use terminology and practices in the region.
5. Brain storming session of experts in the region for assessment of potential of such systems and methodology for verification.
6. Dialogue with selected communities—to understand possible benefits and bottlenecks.
7. Participatory assessment of few systems/practices.
8. Assessment of policy and institutional constraints in scaling up of such systems.
9. Evolve strategies for large scale promotion of multiple water use systems through on-going programs and other models
10. Tradeoffs and complementarities analysis

Outputs

The products, services or results that must be delivered for the project's purposes to be achieved

1. Multiple use options under various scenarios applicable to eastern region – documented
2. Network of practitioners developed
3. Strength and weakness (including constraints) in implementing Multiple Use Systems analyzed, remedial measures documented
4. Policy and institutional issues for scaling up documented.

Milestones

Activities	Period in Months			
	3	6	9	12
Reviewing of options/practices and documentation	*			
Networking	*	*		
Desk based studies	*	*		
Brain storming session		*		
Survey and dialogue with communities		*	*	
Participatory assessment of few systems/practices			*	
Assessment of policy and institutional constraints in scaling up of such systems			*	
Evolve strategies for large scale promotion				*
Tradeoffs and complementarities analysis				*
Report writing				*

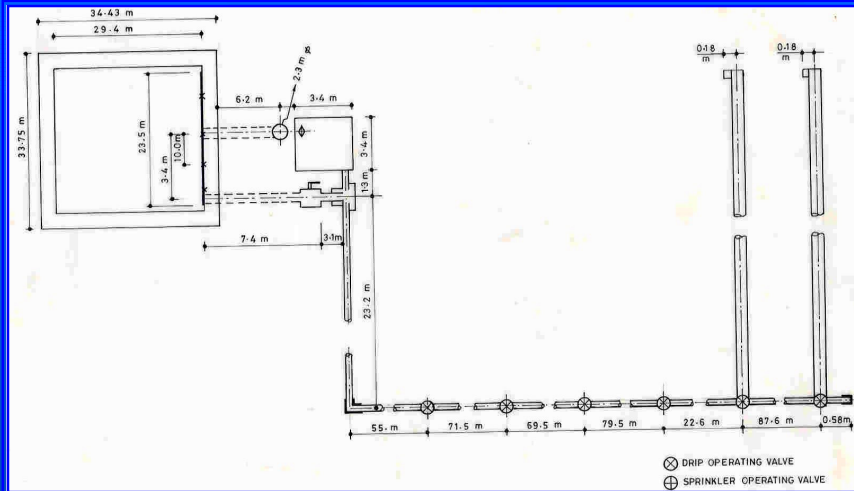
Budget

Sl. No.	Item	Rate	Qty.	Cost
1.	Personnel cost			
	a) Dr. M. A. Khan	2500/- day	30 days	75000
	b) Dr. Abdul Haris A.	2000/- day	30 days	60000
	c) Others	2000/- day	10 days	20000
2.	Travel Accommodation			150000
	a) Dr. M. A. Khan	5000/- day	15 days	75000
	b) Dr. Abdul Haris A.	3000/- day	15 days	45000
	c) Others	3000/- day	10 days	30000
3.	Operational cost			
	Office supplies			100000
	External Payments			200000
4.	Intellectual Fee			500000
Total				1255000
5.	Contingency @ 5 % of Budget			62750
6.	Overheads @ 20 % of Budget			251000
7.	Grand Total			1568750



Some Examples of Multiple Water Use Systems in Eastern Gangetic Basin

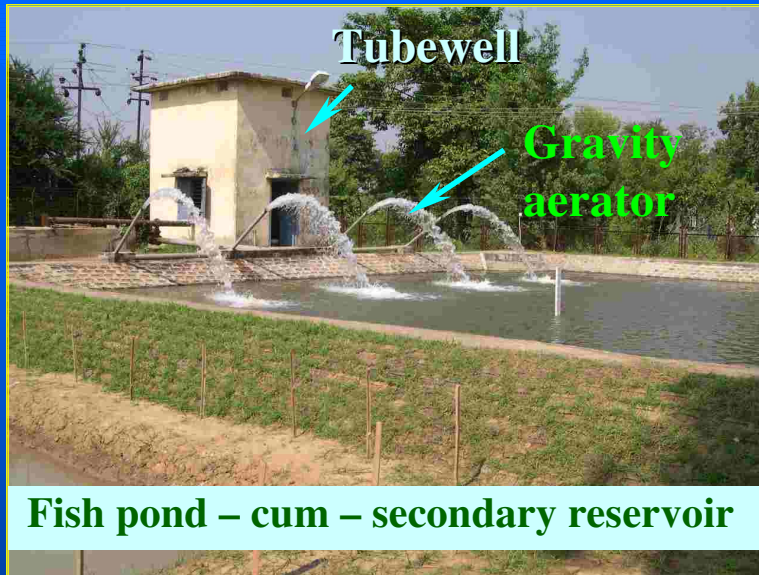
Multiple uses of CANAL based irrigation systems



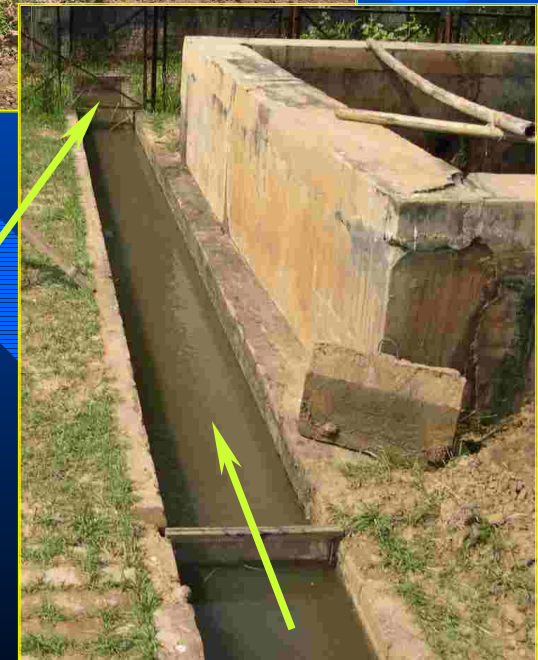
Pressurized irrigation adjunct to canal at WTCER, Bhubanesbar

- 2510 m³ service reservoir to regulate supply to 1.9 ha area under drip and 2.8 ha under sprinkler
- Fish culture and horticulture integrated with the system.
- Huge networks of canals offers opportunities for fish culture. Successful utilization of canals as fish fingerling nursery pools, demonstrated by WTC, TNAU.
- Net return from 1 KM of canal worked out to be Rs 10,000/-.

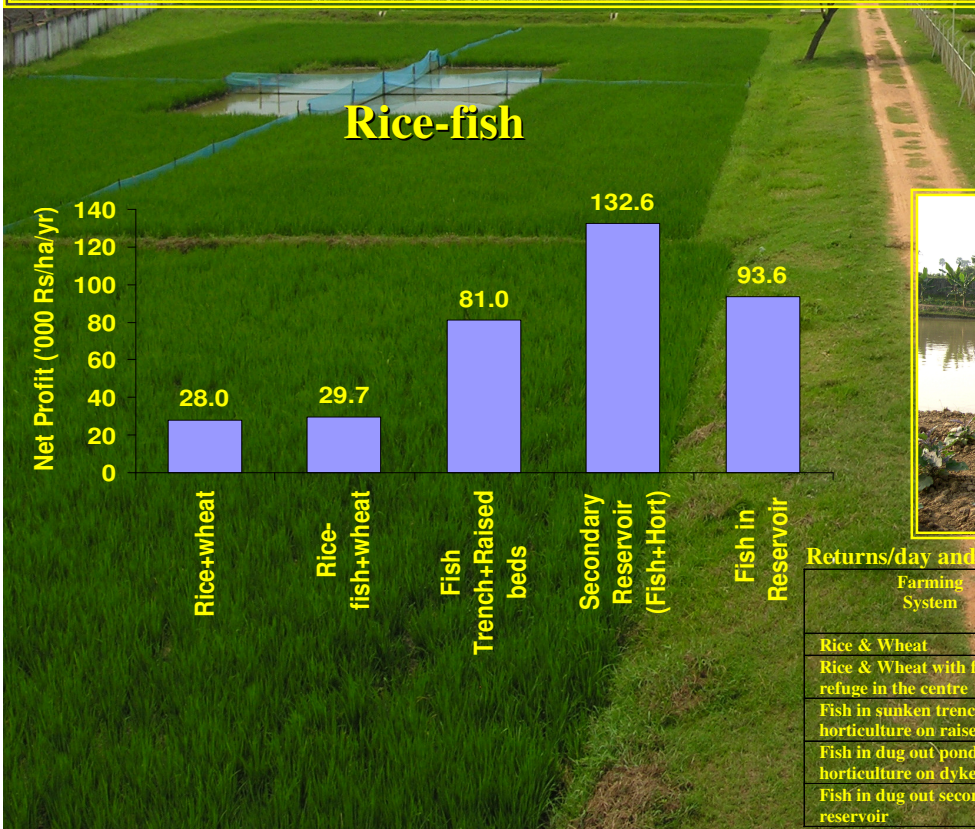
Multiple uses under tubewell irrigation systems



To field
channel
network



Multiple use based IFS in Waterlogged areas



Returns/day and Employment generation

Farming System	Gross Return/day/ha	Net return /day/ha	Labour employed/Ha
Rice & Wheat	150.6	76.6	220
Rice & Wheat with fish refuge in the centre	154.4	81.4	250
Fish in sunken trenches, horticulture on raised beds	389	221.8	720
Fish in dug out pond and horticulture on dykes	641.9	363.3	800
Fish in dug out secondary reservoir	462.3	256.3	451



Multiple Use of Water



Rice Fish Culture

Refuge – 10 %

Paddy yield enhanced by 7 to 13 %.
Overall income enhanced by 11-32 %
Return – Rs 30000/ ha

Net Income from
Trenches and beds-Rs 80000 /ha
(fish-banana vegetables)

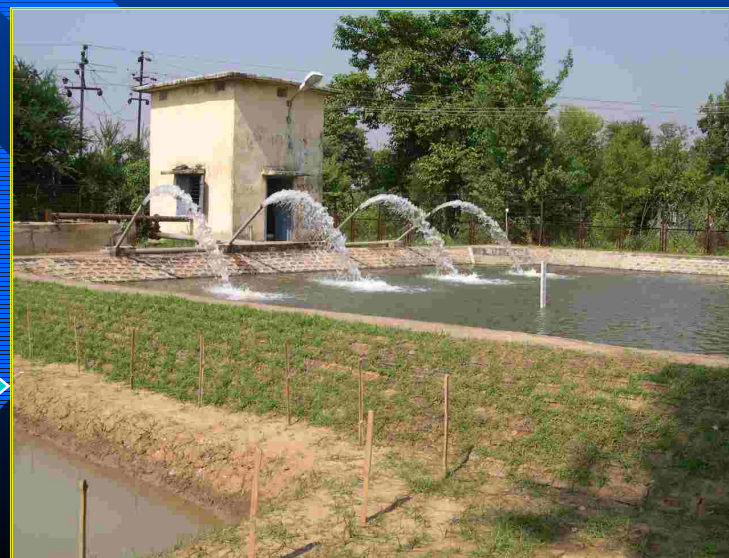


Fish-cum- horticulture



Total income generated
from secondary reservoir
(Crop+ Vegetables +
Fruits + Fish)
- Rs 1,32,000/ha/year

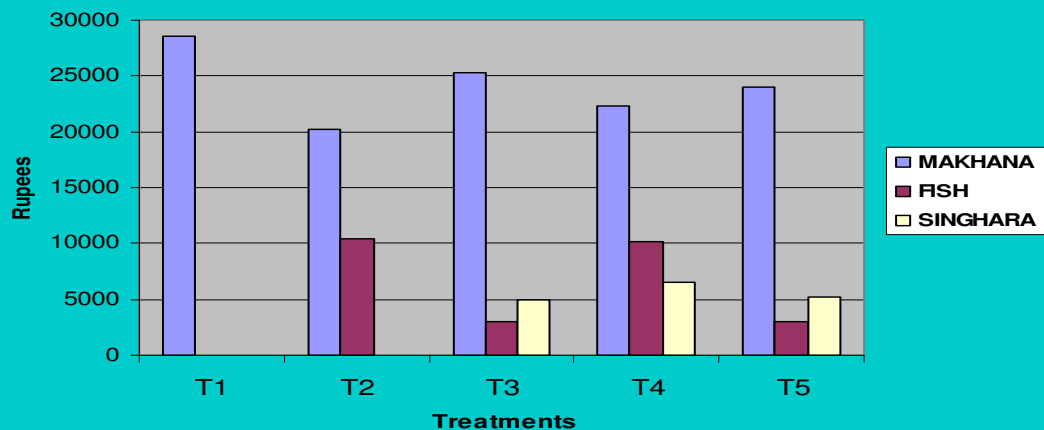
Additional benefit
from fish – 11t/ha



Management strategy for maximization of productivity of water bodies through Makhana based integrated aquaculture farming system

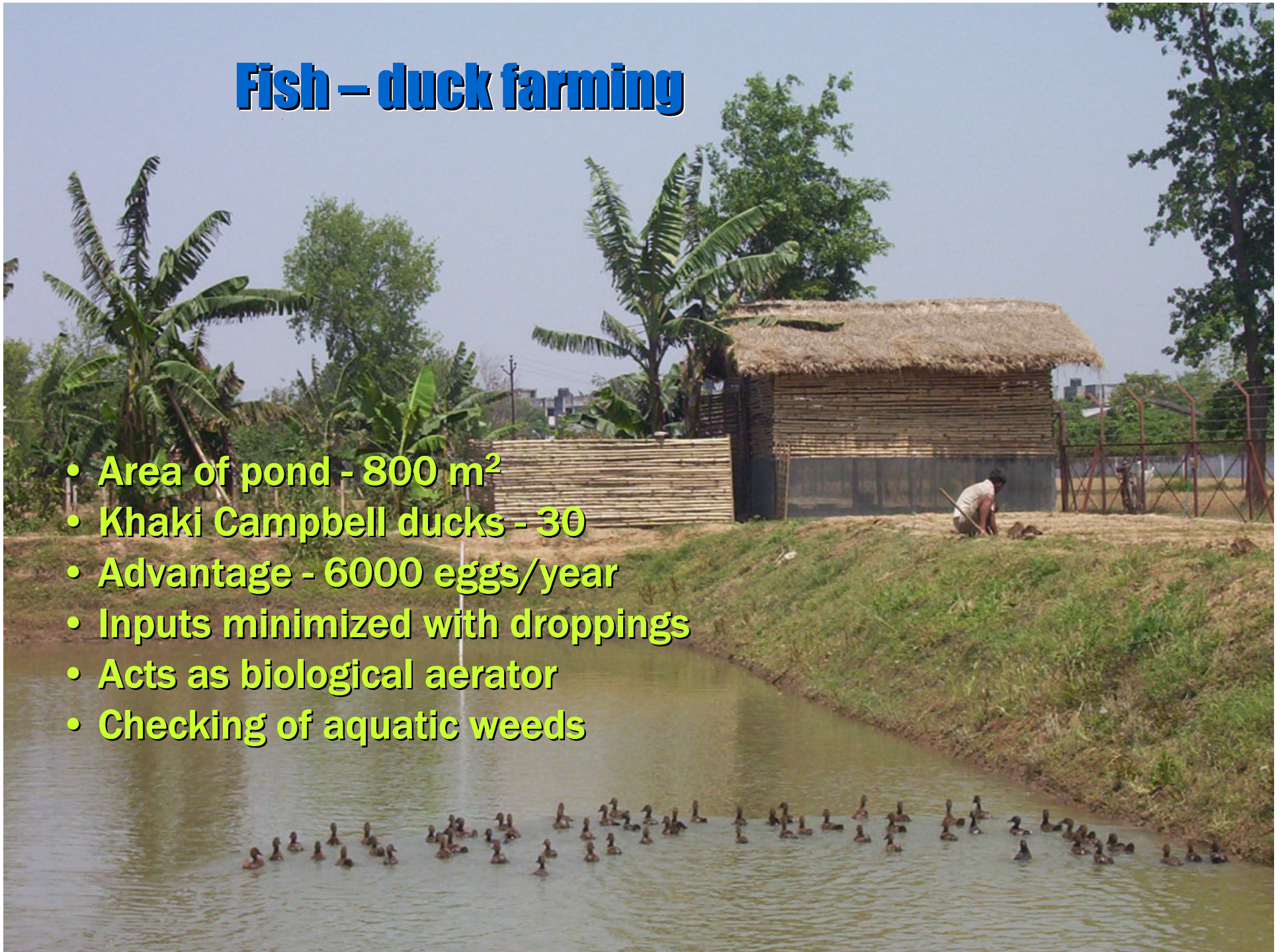


Enhancing productivity of waterbodies through multiple uses of water



Fish – duck farming

- Area of pond - 800 m²
- Khaki Campbell ducks - 30
- Advantage - 6000 eggs/year
- Inputs minimized with droppings
- Acts as biological aerator
- Checking of aquatic weeds



Fish culture under pens

Area of Pit – 240 m²

**Income obtained by selling of fish
> Rs 4000/- against Rs 1400/-**

Net benefit – About Rs 1000/-



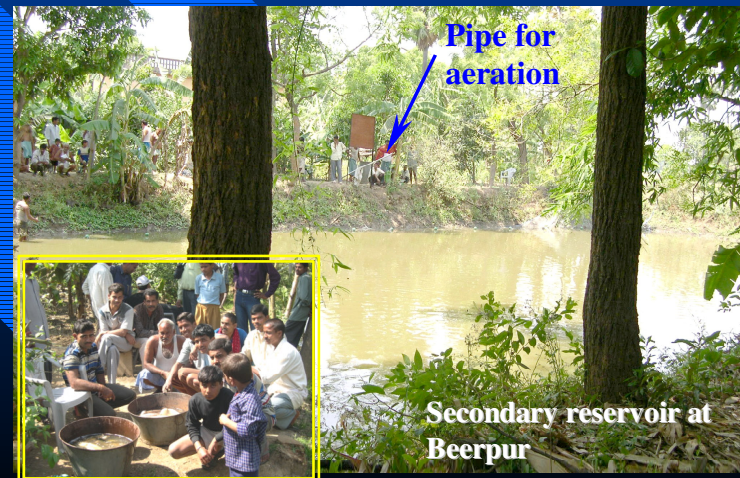
Multiple Use of Water



- Rice-fish culture under pens in waterlogged areas



- Multiple use of water using secondary reservoir for irrigation, fishery, horticulture



Exposure to Farmers

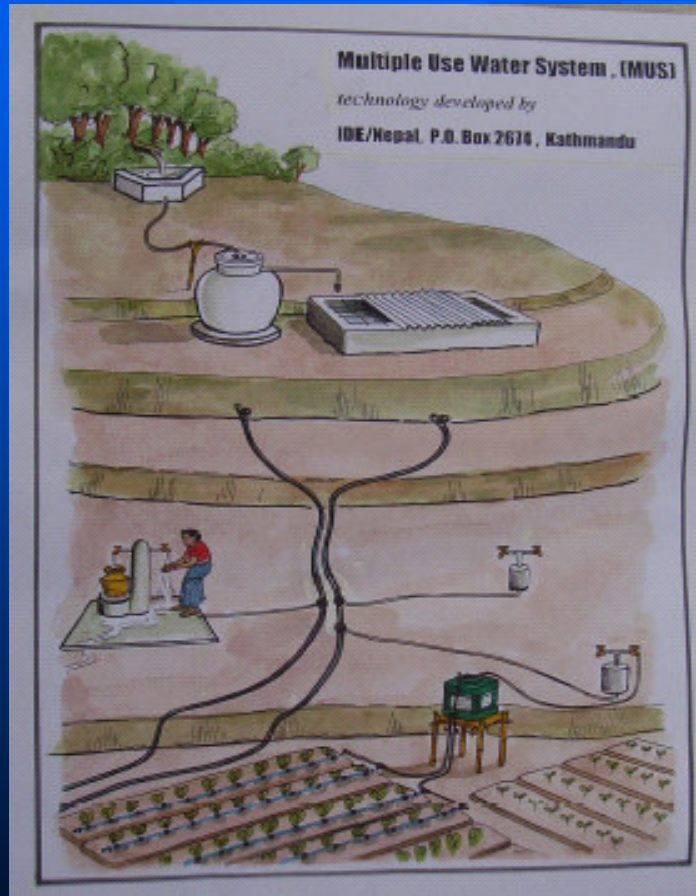
Relative returns (Rs/ha/year) of different diversified systems in farmers' field in canal command, Patna, Bihar (2006-07).

Diversification systems	Gross income (Rs)	Cost of cultivation (Rs)	Net income (Rs)	Per cent contributions to net income				
				Rice & Wheat	Fish	Fruits	Vegetables	Others
Rice & Wheat	45,750	23,555	22,195 (-)	100				
Rice fallow	24000	9800	14200					
Rice -fish in water logged area	47736	13500	34236 (141)*	27	63			
Fish in sunken trenches, horticulture on raised beds	55900	6950	48950 (120)**		83	7.5	9.5	
Fish in dug out pond and horticulture & pigeon pea on dykes	111,000	44,580	66,420 (199)**	0	89.5	2.8	5.8	3.9

* Value indicates per cent increase over traditional rice production

** Values in parenthesis indicate per cent increase over traditional rice-wheat system

Hybrid Water system in Nepal



Water Outlets : Tap Offtakes



Small holder Irrigation in Maharashtra



Smallholder-level irrigation is an effective entry point for enabling smallholders to become more profitable market participants in Peri-urban area.

Low-Cost Water Bags

- Dual layer (woven plastic outer layer supports thin waterproof inner bladder)
- Cost: \$ 0.01 to \$ 0.02 per liter
- Manufactured in sizes from 20 to 10000 liters
- Stores water for drip irrigation and domestic use





**Two home garden drip kits
irrigating 20 m² each**

**T
H
A
N
K

Y
O
U**

MULTIPLE WATER USE FOR FUTURE



THROUGH PEOPLE'S PARTICIPATION