CGIAR INITIATIVE ON Asian Mega-Deltas

Protocol for Participatory on-Farm Experiment for Rice Field Fisheries/rice field Pond

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Asian Mega-Deltas

Contents

WorldFish Technical Assistance provision for Securing the food systems of Asian Mega-Deltas for climate and livelihood resilience (AMD).
Work Package 1: Adapting deltaic production systems

1. Introduction and objective

The Asian Mega-Deltas is one of the CGIAR's research initiatives which aims to create resilient, inclusive and productive deltas, which maintain socio-ecological integrity, adapt to climatic and other stressors, and support human prosperity and wellbeing, by removing systemic barriers to the scaling of transformative technologies and practices at community, national and regional levels.

Work Package 1 (WP1), Adapting deltaic production systems, one of AMD's five work packages, will facilitate scaling innovation to support resilient diversified deltaic production systems and reduce environment footprints and climatic risks. This will be done by stakeholders in learning alliances, providing technical knowhow on land suitability and agronomy, fisheries/aquaculture and enabling value chain development.

Cambodia's rain-fed and flooded rice fields are important and productive sources of inland fish and other aquatic animals, including frogs and snails. These aquatic resources are important to millions of Cambodians, particularly those in rural areas. They make important contributions to rural livelihoods, to food security, climate change, nutrition and income generation. Through their roles in protecting wild fish during dry periods and providing good habitats for fish to breed, spawn and grow, CFRs maintain and increase fish numbers in the surrounding rice fields. FiA has supported the establishment of 183 CFRs (FiA data 2022) in the Mekong Delta, which have increased the production of rice field fisheries. The major physical domains/components for a RFF/CFR system in Cambodia consist of: 1) a Community Fish Refuge, 2) a migration channel, and 3) the floodplain rice fields which consist rice-field pond (Brook, A et al 2015). Ricefield ponds in rice fields not only play an important role for fish refuge ponds during spell drought in wet season, but they also contribute to the family income of the ricefield ponds owner after crop harvesting. However, some ricefield pond have low production due to location or management of the pond. Ricefield ponds are located within the vicinity of the CFR. 28% of the households own at least one ricefield pond of a relative small size. The average catch is 35 ± 55 kg/year, with a large variation ranging from 2 – 450 kg/year (Joffre, 2013). Some fish are stocked for brooding back to the ricefield pond such as Snakehead fish, Catfish, Climbing perch until they can catch them again in March or April. The purposes of this rice-field pond experiment are:

- To identify the fish yield, income and nutrient for rural people;
- To introduce and demonstrate the technologies adapted climate resilience to increase productivities of fisheries and paddy yield.
- To identify the survival rate and weight gain of fish stocked after brooding fish during dry season.

2. Materials and methodologies

2.1. Experimental design

The experiment was designed with 2 productions consisting of rice-field fisheries (ricefield pond) and rice crop. The ricefield pond trial farmers will be selected from households that have a rice field pond which is influenced by the CFR (within from 0.5 Km to 3 Km distance from the CFR) and that was dug one or more years prior to intervention. In addition to ensure no people steal the fish, the pond must be close to the house or be managed by the farmer. The fish will naturally be stocked from the wild. However, the pond must have at least one fish inlet which connects to the rice-field or canal.

The wild snakehead, climbing perch and walking catfish will be released at a 0.5 fish/m^2 density into the pond base on discussion with community and FiAC. The size of the stocked fish will be small, between 50-100 grams/fish.

The farmers will be selected from Svay Teab and Peanea, influenced by Boeng Plang CFR, Ang Baksei influenced by Srei Kru, Kpob Trabek and Tour Toeng Thngai CFRs. Detailed information on the selected sites is available in annex 1.

The experiment is designed to evaluate the climate resilient production and economic performance of the rice fish system by comparing the seed rate options integrated with marketable fish species. There will be two treatments:

Table 1. Summary of specific rice field fisheries (trap-pond) practices using for the pilot trial.

Treatment		T1 (Improved practices)	T2 (Farmer practices)
I. Rice			
1	Seed rate	80 kg/ha^{-1}	200 kg ha^{-1}
	Rice variety	Short-duration cultivar	Short-duration cultivar
2	Crop establishment	Mechanized row direct seeding	Hand broadcasting
II. Fish			
3	Fish species	The wild fish plus release 0.5 fish/m2 (snakehead, climbing perch and walking catfish with the same proportion)	The wild fish
4	Fish feed	Natural feed (insects)	No feed
5	Habitat	Grow aquatic plants to cover 30-40% of the pond and the edge of pond. Add fish shelter to protect the fish	No intervention
6	Inlet outlet	At least two fish inlet-outlet	No intervention

2.2. Project intervention and farmer support

Depending on the appropriate time and planting season, the experimental project will facilitate the implementation of rainfed rice production of farmers in each province as follows:

The farmers will contribute/commit for the experiment as below:

- Have own pond and prepare the pond,
- Manage the pond to ensure someone didn't steal the fish,
- Improve the pond (inlet-outlet, grow/or remove aquatic plant), the project will pay for it,
- Collect snakehead and release in the pond, the project will pay for it,
- Record the logbook regular (stocking, harvest, labor, water quality etc.), the project will support give book, pen, and other materials,
- Observe and test water in the pond regularly,
- Farmer cannot harvest the fish before February 2024 or have get confirm from the partner staff, the farmer must pump the water and project will support the pumping fee. The fish/OAA collected must be counted and weighed before the farmer can use it
- In addition, the project will provide sowing in their own rice fields nearby the ricefield ponds:

a. Farmer need to use mechanized row direct seeding, r treatment sites in Takeo, project will be paid labor cost for farmers.

b. The farmers will record data of crop planting date, harvesting date, expenditure on agricultural input and crop cut data for rice farming in Takeo for economic analysis.

2.3. Pond and water management

The pond selected will be managed to ensure aquatic plant cover at 30-40% (Kim, M et al 2019) and fish shelter, especially during the dry season and while fish are present in the pond. Moreover, when the pond is not connected to flood waters, the fish will be eating from the environment food chain likes small fish species, insects, and plankton until harvesting (table 2).

Table 2. Trial work plan.

Activities	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Pond selection	■	■	■									
Pond and fish migration preparation			■	■								
Rice crop establishment				■	■							
Aquatic plants management to improve water quality (enhancement of food available of the food chain)				■	■	■						
Release additional fish							■	■				
Pond management					■	■	■	■	■	■	■	
Harvesting Rice							■	■				
Harvesting-Fish										■	■	
Field-day event										■	■	

3. Data collection

There will be two level of data recording. The farmer will record in the logbook which is provided by project regularly (TBD). The logbook will be kept in the farmer house and the partner will check the farmer record while they follow/support the farmer. The partner staff will collect from the logbook which is recorded by farmer at least once per month to put in the kobo platform (TBD).

3.1. Fish stocking and harvesting

The fish will be weighed and counted before being released into the pond. To easily identify the fish stock, the fish will remove one pelvic fin. Only healthy fish (active, eat the feed) will be selected for release into the pond to ensure that the fish will not die after release. The fish will be kept in a Hapa at least one day before release into pond. Fish that die in the hapa will be replaced with fish of similar size. The harvest will take place all at once and the total harvest will be counted and weighed by separate by species and marked.

In addition, the post-harvest fish utilization will be recorded in the logbook, including: weight consumed, weight of fish processed, weight of fish sold, price of fish sold, harvesting time.

3.2. Water quality sampling

The incidence of high turbidity from silt particles in suspension is currently one of the greatest factors affecting water productivity in RFF system (Fisheries Administration, 2016). The black fish species mostly tolerate low quality water. However high turbidity prevents plankton growth and food for other small fish which they the most important for food chain in the ricefield pond during disconnect period. The farmer will record water transparency in the pond, water level in pond, and rice field next to the pond twice per month.

3.3. Rice crop cut data

There are 5 samples of crop cut will be collected from one rice field (both treatment and control).

4. Data management and reporting

4.1. Data cleaning

The partner staff will review and check the data recorded by the farmer on a daily record in logbook. At the end of each month, WorldFish will develop a "cleaned" data set that has been checked for errors, with corrections made when possible or removal of the outliers' data.

4.2. Data management

The data collected will be exported from kobo and store as excel file every month as the raw data. The clean data will be compiled in one excel file and shared to the team for reporting to avoid issues of version control, data duplication, and data loss. The raw and clean data will be stored in cloud storage on Microsoft OneDrive will prevent data loss in the event of damage to equipment (hard drives, servers, etc.).

4.3. Data analysis

For each farm, the reported metrics are as follows: weight of harvested fish (kg), count of harvested fish, weight of harvested and marked fish (kg), count of harvested and marked fish, weight of fish consumed (kg), weight of fish processed (kg), weight of fish sold (kg), price of fish sold (KHR/kg), change in weight of marked fish (kg), change in number of marked fish. To calculate changes for marked fish number and weight:

For weight: weight of harvested and marked fish (kg) - weight of marked fish added to the pond before harvest (kg)

For number: count of harvested and marked fish – count of marked fish added to the pond before harvest

For each metric, take the median or average for the treatment farm type. Report the median or average, standard deviation, and minimum and maximum values for each farm type. This can be done in a chart or a table as below.

Table 3. Table template for data reporting.

	T1				T2			
Metric	Median or average	Standard deviation	Maximum	Minimum	Median or average	Standard deviation	Maximum	Minimum
weight of harvested fish (kg)								
count of harvested fish								
weight of harvested and marked fish (kg)								
count of harvested and marked fish								
weight of fish consumed (kg)								
weight of fish processed (kg)								
weight of fish sold (kg)								
price of fish sold (KHR/kg)								
Change in weight of harvested and marked fish (kg)								
Change in count of harvested and marked fish								
weight of harvested rice (kg/ha)								

5. References

Brooks, A., Kim, M., Sieu, C., Sean, V., Try, V., 2015 A characterization of community fish refuge typologies in rice field fisheries ecosystems.

Fisheries Administration, WorldFish and Food and Agriculture Organization of the United Nations. 2016. Training Module on Community Fish Refuge / Rice Field Fisheries Enhancement – a good community fish refuges management practice for food security in Cambodia. Fisheries Administration, Phnom Penh, Cambodia.Joffre, O. (2013) How important are the rice field fisheries? A livelihood baseline survey around the Tonle Sap Lake for the Rice Field Fisheries Enhancement Project. USAID, WorldFish.

Fisheries Administration. 2022 CFR data in Prey Veng, Takeo, Svay Rieng, and Kandal.

Kim, M., Mam, K., Sean, V., Brooks, A., Thay, S., Hav, V., et al. (2019). A Manual for Community Fish Refuge-Rice Field Fisheries System Management in Cambodia. Phnom Penh: Fisheries Administration and WorldFish Cambodia.

6. Annex

Annex 1. List farmers rice-field pond demonstration

No	Farmer name	Sex	Village	Commune	District	Province	Pond size	Type
1		ប	ស្វាយទាប	អំពិលក្រៅ	ស៊ីធរកណ្តាល	ព្រៃវែង	20 x 40 x 3	Control Site
2		ប	ស្វាយទាប	អំពិលក្រៅ	ស៊ីធរកណ្តាល	ព្រៃវែង	15 x 20 x 3	Treatment
3		ស	ពានា	អំពិលក្រៅ	ស៊ីធរកណ្តាល	ព្រៃវែង	15 x 25 x 3	Treatment
4		ប	ពានា	អំពិលក្រៅ	ស៊ីធរកណ្តាល	ព្រៃវែង	15 x 15 x 2	Treatment
5		ប	ពានា	អំពិលក្រៅ	ស៊ីធរកណ្តាល	ព្រៃវែង	15 x 40 x 2.5	Control
6		ប	អង្គបក្សី	ជាងទង	ត្រាំកក់	តាកែវ	15 x 40 x 3	Treatment
7		ប	អង្គបក្សី	ជាងទង	ត្រាំកក់	តាកែវ	11 x 16 x 2	Treatment
8		ប	អង្គបក្សី	ជាងទង	ត្រាំកក់	តាកែវ	20 x 30 x 3	Treatment
9		ប	អង្គបក្សី	ជាងទង	ត្រាំកក់	តាកែវ	13 x 20 x 2	Control Site

Annex 2. Logbook record by farmers

Table 1. Begin_rice_seeding

_rice	_date_006	_weight_of_seed_kg	_seeding_type	_note_005
senkraob	########	21	manual_seeder	

Table 2. Begin_wildfish_release

_date_007	_fish_wild	_other_002	_fish_002	_weight_kg	_source
########	walking_catfish		12	12	xxx

Table 3. Begin_rice_expenditure

_date_008	_item	_other_003	_Quantity_002	_price_unit_002	_total_price	_note_006
########	land_preparation		12	122	122	122
########	Fertilizer		12	12543	3443	33

Table 4. TP_water_quality monitoring.

_date_014	_ricefield_depth_cm	_pond_depth_cm	_transparency_cm	_note_012
2023-07-01	15	250	30	NA
2023-07-30	10	245	30	NA

Table 5. TP_daily_actvities_record.

_item_004	_other_004	_Quantity_004	_price_unit_004	_total_price_004	_note_009
remove_plant		34	422	322	233
Fertilizer		12	123	123	123

Table 6. TP_labor_gender.

activities_tp	_other_005	_implementor	_sex_002	Age_001	_duration_h_day_	_role_001
Feeding		13323	female	22	33	husbands
Feeding		13323	female	22	33	husbands

Table 7. TP_feed.

_Type_of_feed _001	_other_feed _TP	_Quantity_Kg_ Day_001	_Time_ month_001	_Protein_If_ applicable_001	_note_011
insect_feed		12	2	2	wqw

Table 8. TP_harvesting_wildfish_release.

_date_007	_fish_wild	_other_002	_fish_002	_weight_kg	_source
########	walking_catfish		12	12	Xxx
########	snakehead		12	12	Xxx
########	Climbing perch		12	12	Xxx

Table 9. TP_fish_harvest.

_date_016	_fish_003	other_009	_number fish_001	_Total_ weight _Kg_001	_total_ price_ riels_002	_Utilization_ 002	_sold	consumption	_gift_to_ other	_other
########	walking_catfish		21	12	122	_sold _ consumption	1	1	0	0
########	Snakehead		21	12	123	_consumption	0	1	0	0
########	Climbing perch		21	12	122	_sold _ consumption	1	1	0	0

Table 10. TP_rice_ harvest.

_date_015	_rice_001	_other_008	_weight_ kg_001	_price_ riels_ Kg	_total_ price_ riels_001	_Utilization_001	_sold	_consumption	_gift_ to_ other	_other
########	senkraob		123	1233	1233	_consumption _gift_to_other	0	1	1	0

Profitable

Net Profit = (II) – (I) = Net income – Expenditure = ……

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