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Assam Agribusiness and Rural Transformation Project (APART) : Fisheries Sub-Component

Six Month Report-5 (October 2020 to March 2021)

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About WorldFish

WorldFish is an international, not-for-profit research organization that works to reduce hunger and poverty by improving fisheries and aquaculture. It collaborates with numerous international, regional and national partners to deliver transformational impacts to millions of people who depend on fish for food, nutrition and income in the developing world. Headquartered in Penang, Malaysia and with regional offices across Africa, Asia and the Pacific, WorldFish is a member of CGIAR, the world's largest global partnership on agriculture research and innovation for a food secure future.

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Contact

WorldFish Communications and Marketing Department, Jalan Batu Maung, Batu Maung, 11960 Bayan Lepas, Penang, Malaysia. Email: worldfishcenter@cgiar.org

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List of acronyms

AAU	Assam Agricultural University
APART	Assam Agribusiness & Rural Transformation project
ARIAS	Assam Rural Infrastructure and Agricultural Services Society
ATMA	Agricultural Technology Management Agency
AWP	Annual Work Plan
BDMC	Beel Development Management Committee
BMP	Better Management Practices
CGIAR	Consultative Group on International Agricultural Research
COF	College of Fisheries
CIFA	Central Institute of Freshwater Aquaculture
CIFRI	Central Inland Fisheries Research Institute
DOF	Department of Fisheries
DSSC	District Social Sector Coordinators
FDO	Fishery Development Officer
FGD	Focus Group Discussion
FPG	Farmer Producer Groups
FPOs	Farmer Production Organisations
GoA	Government of Assam
HH	Household
ICAR	Indian Council of Agricultural Research
IMC	Indian Major Carps
IRRI	International Rice Research Institute
KVK	Krishi Vigyan Kendra
ODK	Open Data Kit
PDO	Project Development Objective
POP	Package of Practices
TEF	Technical Expert in fisheries
VCDPs	Value Chain Development Plans
WB	World Bank

1. EXECUTIVE SUMMARY

Government of Assam (GoA), through the Government of India has received a loan of US\$200 million from the World Bank (WB) for implementation of Assam Agribusiness and Rural Transformation Project (APART). The Project Development Objective (PDO) of APART is to add value and improve resilience of selected agriculture value chains, focusing on smallholder farmers and agro-entrepreneurs in targeted districts of Assam. Fish has been prioritized as one of the value chains for interventions under APART.

WorldFish, part of One CGIAR, has signed a consultancy agreement with ARIAS on 10th Aug 2018 to offer technical assistance to Fisheries sub-component of APART project over a duration of 5 years. ARIAS has provided the effectiveness date for the contract as 17th Aug 2018.

For the Fifth Six months reporting period (October 2020- March 2021) the following key technical activities were completed:

Between October 2020 and March 2021, due to COVID 19 lockdown and travel restrictions WorldFish experts from Penang and Bangladesh could not travel to field sites in Assam, instead virtually interacted with ARIAS, DOF, COF, APART Project teams, conducted virtual trainings, meetings, initiated climate resilient technologies study, prepared gender scoping study report, developed BMP guidelines, undertook assessments of demonstration practices and provided technical inputs for all the key interventions. Full time resident national consultant interacted closely with ARIAS, DOF, COF and project team and provided technical support for the project activities. In addition, he has coordinated the virtual discussions with WorldFish experts, attended the meetings conducted by World Bank, ARIAS, DOF, COF and other partners, arranged inputs from WorldFish technical experts and linked it to DOF and project beneficiaries through the 15 FDOs and 15 TEFs in the 15 Districts selected for fisheries sub-component of APART.

Enterprise development opportunities identified in the fish value chain study were communicated and discussed with several APART partners and service providers and collaborations established to support small enterprise development. Enterprise development around the fish feed value chain for the establishment of small and medium feed mills to supply quality fish feeds at affordable costs, establishment of dry fish production clusters to produce hygienic dry fishes for Assam and other North Eastern states, establishing value added fish product units to produce traditional fish products like *Namsing* and *Shidol*, establishment of hygienic retail outlets, live fish transportation units are a few worth considering to fill the gaps in fish value chain. WorldFish closely interacted with ARIAS, DOF and Service providers for the establishment of Farmer Producer Groups in Fisheries and also support to identify the activities to be promoted through the FPCs.

WorldFish along with DOF has organised Focus Group Discussion on Better Management Practices for the Farmer Producer Groups of Fisheries component in the APART Project Districts. During the reporting period 11 FGDs were conducted in which 322 farmers including women and youth participated. A series of virtual meetings, discussions,

trainings, and Workshops were arranged for the benefit of DOF officials, APART Project staff and COF faculty.

WorldFish along with ARIAS and DOF conducted Gender scoping study in 7 APART Project districts to understand the gender dynamics, gender norms and barriers for gender integration in the project interventions of fisheries component WorldFish gender experts developed the report of the gender scoping study conducted in selected districts of Assam.

WorldFish developed KOBO online forms for collection of data from the beneficiaries and non-beneficiaries of the different interventions in the identified clusters of the project districts. Results of key production related interventions are being collected using ODK tools for performance analysis and fine tuning of BMPs.

World Bank Mid-Term Review Mission of the APART Project was held during the period from 14th to 21st December 2020. On 14th December 2020, the start-up meeting was attended by Dr. Bekzod and World Bank Mission Team, Shri. Rajesh Prasad, APC, Shri. Vinod Sheshan, SPD and ARIAS Team, Secretaries and Directors of the line departments, International Agencies and Service Providers. On 19th December 2020, Mini-Mission to review the Fisheries Activities was held in which the Mission members, Fishery Coordinator and ARIAS Team, Director of Fisheries, Nodal Officer from Department of Fisheries, Dr.C.V. Mohan, Shri.Nirmallya Mandal and Dr.R. Suresh from WorldFish participated. During the meeting, WorldFish activities in the APART Project to provide technical support for the fishery sub-component since inception was presented by Dr. R. Suresh, Resident Consultant.

2. INTRODUCTION

WorldFish has signed a consultancy agreement with ARIAS to offer technical assistance to Fisheries sub-component of APART project over a period of 5 years. The project development objective of the Assam Agribusiness & Rural Transformation Project (APART) is to “add value and improve resilience of selected agriculture value chains, focusing on smallholder farmers and agro-entrepreneurs in targeted districts of Assam”. Keeping in line with the Project Development Objective of APART, the WorldFish technical contribution has the following five broad objectives:

1. Enable sustainable increases in aquaculture production without creating adverse socio economic or environmental impacts (Sustainable Intensification of Aquaculture)
2. Secure and enhance the contribution of small-scale fisheries to food security in Assam (Increasing Diversity and Productivity of Beels)
3. Increase the availability, access and consumption of nutrient-rich, safe fish, especially for women of reproductive age, infants and young children (Improving Fish Value Chains and human nutrition)
4. Develop and promote climate resilient technologies in support of sustainable aquaculture and small-scale fisheries (Climate resilient/smart aquaculture technologies)
5. Promote gender transformative approaches in support of sustainable aquaculture and beel fisheries in Assam (Gender Transformative Approaches in aquaculture & fisheries)

WorldFish has developed an approach to offer technical assistance to implementing partners on a continuous basis to accomplish the broad objectives through 10 key deliverables, namely:

- Deliverable 1: Promoting adoption of BMPs for sustainable intensification of aquaculture
- Deliverable 2: Up-gradation of Existing Indian major carp hatcheries to produce certified seed
- Deliverable 3: Multiplication Centres (MCs) for genetically improved fish strains
- Deliverable 4: Improving productivity of beels
- Deliverable 5: Improving Fish Value Chains
- Deliverable 6: Carp-Mola polyculture
- Deliverable 7: Improving impact of aquaculture and beel fisheries on human nutrition
- Deliverable 8: Promoting climate resilient smart fish production technologies
- Deliverable 9: Gender transformative approaches in support of sustainable aquaculture and beel fisheries
- Deliverable 10: Capacity building of DoF Officers

For each of these deliverables purpose, work done during the reporting period and the observations and recommendations to the implementing agencies is provided under Section 5. Similarly the activity wise work done for all the 10 deliverables during the reporting period is given in Section 9

3. TECHNICAL REPORT

WorldFish activities and recommendations for the project from August 2018 to September 2020 have already been presented in the following reports:

1. **Inception report** was submitted to ARIAS and DOF in Sept 2018 and the same has been approved by the ARIAS
2. **Inception workshop report** for the workshop that was completed in Aug 2018 to communicate the principles and concept of key interventions under the project to a large group of stakeholders and agree on the roles and responsibilities of WorldFish, DOF and COF
3. **First Six Months report (August 2018 to March 2019)** was submitted to ARIAS and DOF in April 2019 and the same has been approved by the ARIAS
4. **Second Six Months report (April 2019 to September,2019)** was submitted to ARIAS and DOF in October 2019 and the same has been approved by the ARIAS
5. **Third Six Months report (October 2019 to March 2020)** was submitted to ARIAS and DOF in April, 2020 and the same has been approved by the ARIAS
6. **Fourth Six Months report (April 2020 to September,2020)** was submitted to ARIAS and DOF in October 2020 and the same has been approved by the ARIAS
7. **Mid Term review report for the World Bank Mid Term review mission was submitted to ARIAS and DOF on 16th Oct 2020.**

This 5th Six Months report is in continuation of previous reports, should not be seen in isolation and all recommendations provided earlier are still valid. This report particularly captures the work done during the period from October, 2020 to March, 2021 and provides additional observations and recommendations for implementing partners.

For successful implementation of key interventions, it is very essential to ensure synchronization and integration of WorldFish observations, recommendations and technical inputs to the Annual Work Plan of DOF, the implementing partner for the fisheries sub-component of APART.

The present report includes the following major activities taken up by WorldFish during the period from October, 2020 to March, 2021.

WorldFish Experts Inputs: Between October, 2020 and march, 2021 WorldFish experts interacted with World Bank, ARIAS, DOF, COF and project staff and provided technical inputs for all the key interventions. Due to COVID-19 lockdown and travel restrictions, WorldFish team provided technical support virtually for the project activities and gave necessary recommendations. Draft BMPs for Polyculture of carps with genetically improved fish strains and Polyculture of carps with Freshwater Prawns were developed by WorldFish for distribution among the project beneficiaries for adoption of improved farming practices.

Resident Consultant Inputs: Full time Resident consultant from WorldFish is working in Assam since 7th January 2019 and is interacting closely with ARIAS, DOF, COF and project team and providing technical inputs related to all the 10 deliverables. In addition, he has participated in the virtual meetings organised by World Bank, ARIAS, DOF and COF, organised virtual discussion of DOF, COF, ARIAS and project staff with WorldFish experts, coordinated inputs from WorldFish technical experts and linking it to DOF and ARIAS for the project implementation of the fisheries sub-component of APART (***Resident National Consultant inputs in Section 10***)

World Bank Mid-Term Review Mission: World Bank Mid-Term Review Mission of the APART Project was held during the period from 14th to 21st December, 2020. On 14th December, 2020 the start-up meeting was attended by Dr. Bekzod and World Bank Mission Team, Shri. Rajesh Prasad, APC, Shri. Vinod Sheshan, SPD and ARIAS Team, Secretaries and Directors of the line departments, International Agencies and Service Providers. Progress of the fisheries activities under APART was presented by the Nodal Officer, APART and Director of Fisheries and WorldFish was represented by Dr.C.V.Mohan, Project Leader and Dr. R.Suresh, Resident Consultant. On 19th December, 2020, Mini-Mission to review the Fisheries Activities was held in which the Mission members, Fishery Coordinator and ARIAS Team, Director of Fisheries, Nodal Officer from Department of Fisheries, Dr.C.V.Mohan, Shri.Nirmallya Mandal and Dr.R.Suresh from WorldFish participated. During the meeting, WorldFish activities in the APART Project to provide technical support for the fishery sub-component since inception was presented by Dr. R.Suresh, Resident Consultant. Mission team members discussed the Fish Value Chain Study conducted by WorldFish, potential for freshwater prawn farming in Assam, Hygienic fish marketing by FishFed. Dr.C.V.Mohan explained the Nutritious pond concept demonstrated by WorldFish in Bangladesh. Mission team appreciated the efforts of WorldFish in providing technical support to the farmers through BMPs and Record Books for the all the interventions in fisheries. (***Details of the World Bank Mid-Term Review Mission is provided in Section 8***)

Virtual Meetings/Discussions/Trainings/Workshops: During the recent COVID-19 pandemic situation due to travel restrictions, WorldFish experts and Resident consultant provided virtual support for the implementation of project interventions by providing necessary technical support to ARIAS, DOF and COF. A series of virtual meetings, discussions, trainings and Workshops were arranged for the benefit of DOF officials, APART Project staff and COF faculty During these virtual programmes the WorldFish experts provided technical support to DOF officials, APART Project staff, ARIAS Specialists and COF faculty members who actively participated. (***Annexure 1***)

Climate Resilient Technologies Study: Application of Climate resilient technologies for productivity enhancement is a project intervention area under APART. Demonstration of these technologies to support both pond aquaculture and beel fisheries are key areas for technology application. With this objective WorldFish has initiated the study for mapping the existing climate resilient

technologies practiced by the farmers, identifying the Indigenous Technical Knowledge (ITKs) in climate resilient practices, addressing the gaps in the adoption of climate resilient technologies and to assess the scope for adoption of climate resilient technologies/practices by all fish value chain players. During the reporting period, Stakeholder consultations with ARIAS, DOF, COF have been conducted and FGDs with stakeholders from pond aquaculture and beel fisheries were arranged for better understanding of the climate resilient practices in beel fisheries and pond aquaculture. Qualitative and quantitative data collections using various tools and methodologies are taken up in the project districts including assessment of the various climate resilient technologies demonstrated in the project by College of Fisheries and implemented by Department of Fisheries. The study is going on at present and will be completed and the report will be submitted to ARIAS, DOF and COF for adoption of recommended climate resilient practices.

Gender Scoping Study: WorldFish along with ARIAS and DOF conducted Gender scoping study in 7 APART Project districts to understand the gender dynamics, gender norms and barriers for gender integration in the project interventions of fisheries component. Further the community profile of the beel user communities and pond aquaculture communities in the clusters were collected, analysed and presented in the Report of the Gender scoping study conducted in selected districts of Assam. (*Annexure 2*)

Covid-19 Impact Study: WorldFish conducted a study during the period from February to November, 2020 to understand the impact of Covid-19 on the aquatic food value chain in Assam. The study was conducted through telephone survey on weekly, fortnightly, monthly and quarterly basis among various stakeholders of the fish value chain like fishers, farmers, hatchery operators, feed mills, feed sellers, traders, processors and retailers in most of districts representing various regions of Assam. The impact of Covid-19 pandemic situation in production, marketing, employment, income in fisheries and aquaculture sectors in Assam are presented in the report published by WorldFish. (*Annexure 3*)

Focus Group Discussions: WorldFish along with COF and DOF organised Focus Group Discussion on Better Management Practices for the Farmer Producer Groups of Fisheries component in the APART Project Districts. During the reporting period 11 FGDs were conducted in 7 districts in which 332 farmers including women and youth participated in which BMP for Polyculture of Carps and BMP for Carp-Mola-SIS Polyculture, BMP for Paddy-Fish Integrated Farming were explained (*Annexure 4*)

WorldFish Extension Products: WorldFish developed Draft BMPs for Polyculture of carps with genetically improved fish strains (*Annexure 5*) and Polyculture of carps with Freshwater Prawns (*Annexure 6*)

WorldFish inputs for the Annual Work Plan in Fisheries: For successful implementation of key interventions by the WorldFish under the project, it is very essential to ensure synchronization and integration of WorldFish deliverables to the Annual Work Plan of DOF and COF the implementing partners for the fisheries sub-component of APART. For purposes of this World Bank project the annual work

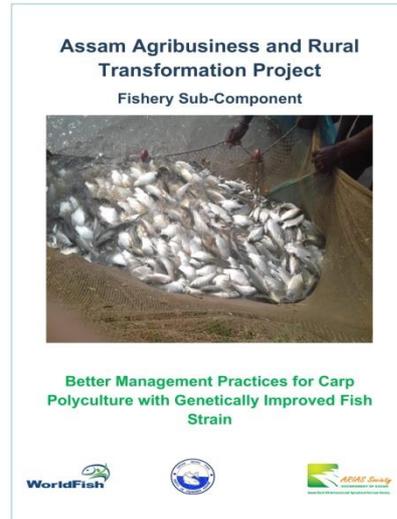
plan is for the period from July 2021 to June 2022. WorldFish is providing required inputs based on the activities and sub-activities of the deliverables while preparation of the Annual Work Plan of Department of Fisheries, College of Fisheries and ARIAS Society. During the reporting period, the AWP for 2021-22 was discussed on 6th March, 2021 with the Nodal Officer, DOF and Fishery Coordinator, ARIAS. Dr.R.Suresh, Resident Consultant, WorldFish participated in the meeting organised by ARIAS Society on 8th March, 2021 for preliminary discussion on the AWP 2021-22 and provided necessary inputs. On 11th March, 2021 Dr.R.Suresh, Resident Consultant, WorldFish attended and provided necessary inputs during the meeting organised by ARIAS Society with College of Fisheries to finalise the AWP 2021-22 for the capacity building programmes and demonstrations.

4. WORLDFISH KNOWLEDGE PRODUCTS

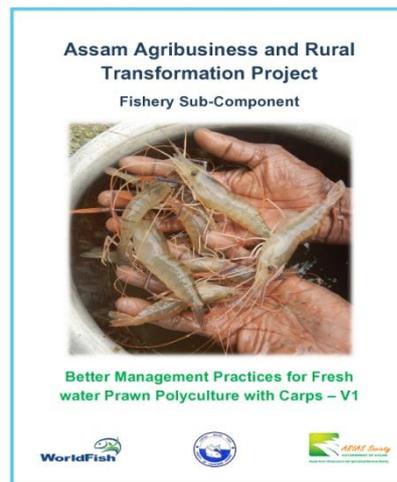
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Knowledge Products

1. Better Management Practices for Polyculture of carps with genetically improved fish strains- Draft Version– English



2. Better Management Practices for Polyculture of carps with Freshwater Prawns Draft Version– English



5. SUMMARY OBSERVATIONS AND RECOMMENDATIONS

Considering the (a) inception workshop findings and baseline information (b) field visits and interactions undertaken by WorldFish experts (c) assessment of current practices and capacity needs of project beneficiaries (d) findings and lessons learned from all interventions implemented during 2018-19 and 2019-20 and (e) regular meetings and discussion with DOF, COF, ARIAS and World Bank teams:

WorldFish is proposing the following generic and specific recommendations for the consideration of ARIAS and DOF for implementation of project activities during Year 3 of the project (2020-21).

D1: Promoting adoption of BMPs for sustainable intensification of aquaculture

Key interventions in the fisheries component of APART which include Polyculture of carps in ponds, Climate resilient Paddy cum fish integrated farming practices in low lying flood prone areas and Beel fisheries follow the Package of Practices (POP) developed by Assam Agricultural University. Over and above the POP, for sustainable intensification of aquaculture practices, WorldFish has been developing Better Management practices for the fisheries activities of the project. Since BMPs are dynamic and evolving over the period, the practices will be revised periodically depending on the adoption and benefits.

So far, the following BMPs were developed by WorldFish:

1. ***BMP for Carp Polyculture – V1***
2. ***BMP for Production of Mola and SIS with Carps– V1***
3. ***BMP for Paddy cum Fish Integrated Farming – V1***
4. ***BMP for Beel Fisheries – V1.***
5. ***BMP for IMC Hatcheries for Quality Seed Production – V1***

During the reporting period, WorldFish provided necessary technical support for the demonstrations for application BMPs to improve the farming practices and also to increase the production and income obtained by the farmers. WorldFish along with Department of Fisheries and College of Fisheries has conducted FPG level training programs for wider dissemination of BMPs.

In addition to the five BMPs already developed, BMP for Polyculture of Freshwater Prawns with Carps and BMP for Genetically Improved Strains are under preparation.

Recommendations:

1. Distributing the BMPs in time to the beneficiaries selected during **2020-21** and also to equal number of non-beneficiaries in the cluster for wider dissemination and adoption.
2. Organising Focus Group Discussion with the FPGs in different clusters on the BMPs for better adoption by the farmers
3. Recording of the activities under the various demonstrations taken up by the beneficiaries in the record books provided.

4. Conducting a survey on the adoption of the BMPs by the beneficiaries and non-beneficiaries of the clusters selected in the project districts at the end of the demonstrations for revising the BMPs.

D2: Up-gradation of Existing Indian major carp hatcheries to produce certified seed

Towards achieving the target of producing quality certified fish seeds, the following hatcheries with the DOF were upgraded:

- (a) Islamabad Fish Seed Farm, Silchar, Cachar district
- (b) Ulubari Fish Seed Farm, Guwahati, Kamrup district
- (c) Joysagar Fish Seed Farm in Sivasagar district
- (d) Borimuri Fish Farm in Lakhimpur district
- (e) Amaranga Fish Seed Farm in Kamrup district

During this reporting period, all the selected hatcheries were upgraded and three hatcheries in Ulubari, Kamrup district, Islamabad, Cachar district and Joysagar, Sivasagar district commenced seed production during the last breeding season. WorldFish provided technical support for the procurement of quality broodstock from natural sources and for broodstock tagging and rearing. WorldFish provided SOP and training for the DOF and APART Project staff for tagging of the brood fish with PIT tags (**Annexure 7**) for proper monitoring and record keeping. BMP for IMC hatcheries for quality seed production developed by WorldFish would help to produce quality carp seeds through scientific breeding programme.

The following measures are recommended to produce certified quality fish seeds by upgraded hatcheries.

Recommendations:

1. The seed production activity has to be implemented in all the 5 upgraded hatcheries during the breeding season in 2021 to produce certified quality seeds.
2. Procurement and stocking of quality broodstock of IMC from natural sources.
3. Tagging of all the broodstock collected from natural waters and record keeping.
4. Capacity building of the hatchery operators and seed growers on scientific carp breeding and rearing for quality seed production.
5. The upgraded hatcheries to implement the improved fish seed production practices following the BMPs provided by WorldFish during 2021 breeding season to produce quality carp seeds for distribution to farmers.

D3: Multiplication Centres (MCs) for genetically improved fish strains:

The purpose of the activity is to establish fish seed multiplication centres for genetically improved fish strains (e.g. Jayanti rohu, Amur carp) for production of genetically improved fish seeds for stocking to increase production and productivity. The following fish farms under DOF have been developed as multiplication centres for genetically improved fish strains:

- (a) J. B. Garh Fish Seed Farm in Nagaon district
- (b) Islamabad Fish Seed Farm in Cachar district
- (c) Rangia Fish Farm in Kamrup district
- (d) Matilang Fish Farm in Goalpara district

During the reporting period, all the multiplication centres were developed as per the approved plan and technical recommendations provided by WorldFish. WorldFish provided necessary technical support to DOF for the procurement of improved strain, Jayanti rohu and Amur carp from National Freshwater Fish BroodBank (NFFBB), Bhubaneswar.

Recommendations:

1. The seed multiplication activities need to be carried out during the year 2021 onwards to provide quality seeds of genetically improved fish strains to the farmers
2. Stocking of genetically improved strains Jayanti rohu and Amur carp need to be promoted by DOF by multiplication and distribution to the farmers.
3. Evaluation of the performance of genetically improved strains, Jayanti rohu and Amur carp need to be conducted.

D4: Improving productivity of beels:

The total target area for the beel development under APART is 2225 ha. Of the total target, in 2019-20, 16 beels covering an area of 304.85 ha in Kamrup, Nalbari Dhubri, Goalpara, Kokrajhar Lakhimpur, Jorhat, Majuli, Sivasagar and Golaghat districts have been approved. WorldFish team has provided necessary support to DOF and ARIAS for the selection of 16 beels on technical grounds. The civil works in connection with the development of beels like weed clearance and bund formation have been taken up in many of the selected beels.

During the year 2020-21 identification of additional area of 500 ha for beel development in the project districts is in progress. So far 20 beels in 8 districts covering 369.92 ha have been selected for development under APART out of which BDMC have been formed in 7 beels with 721 members including 152 women. WorldFish experts have provided BMPs for Beel fisheries development including technical and governance mechanisms for development through the project.

Recommendations:

In each of the beels selected for development, the DOF and APART Project need to implement the BMP guidelines for Beel Fisheries Development provided by WorldFish. The BDMC members have to be oriented through FGD towards the BMPs to be followed for beel improvement. In 2020-21, necessary works connected to technical interventions together with governance issues need be taken up.

D5: Improving Fish Value Chains:

Understanding the Fish Value Chain prevailing in Assam is a pre-requisite for bridging the gaps in the value chain to organise various enterprises and businesses for the development of a sustainable market-led production system. WorldFish has taken up a study to assess the fish value chain, fish feed value chain and the scope of value added products and marketing in Assam. Detailed report of the Fish Value chain study conducted by WorldFish in Assam has already been submitted to ARIAS.

During the reporting period, discussions were held with ARIAS, DOF and other Service providers of the project regarding establishment of FPCs in various APART districts with

specific focus on dry fish production, fish feed production and quality fish seed production. So far, 5 FPC in fisheries have been identified under the project and WorldFish has provided necessary support to ARIAS and Service Providers to identify the potential activities to be taken up by the FPCs.

Recommendations:

1. Initiatives for entrepreneurship development and enterprise development around the gaps identified in the value chain would help for the development of aquaculture in Assam.
2. Community based business organisations like farmer producer companies, Farmer Producer organisations and cooperatives need to be promoted or strengthened for undertaking the activities in the fish value chain.
3. Motivate potential and existing entrepreneurs to take up the role of service providers for various components (production, logistics, value addition and marketing) and support them with right techno-managerial and entrepreneurial knowhow.

D6: Carp-Mola polyculture in ponds, paddy cum fish culture and in beel fisheries

WorldFish based on its experience in Bangladesh and under the FARD and USAID Projects in Odisha is promoting Carp-Mola-SIS Polyculture in pond aquaculture, paddy cum fish farming and also in beels as a nutrition sensitive aquatic food production intervention.

During 2019-20, Carp-Mola-SIS Polyculture demonstrations were conducted with 64 beneficiaries from 10 districts in which 905 kg of Mola and SIS was stocked along with carps in a total water spread area of 21.85 ha. The results of the demonstrations were encouraging and based on the success during 2019-20, during the reporting period, scaling up the technology with 150 beneficiaries covering 50 ha is taken up apart from introduction of Mola-SIS in paddy cum fish integrated farming in 300 ha and in 500 ha beels during 2020-21.

Recommendations:

1. Basic requirements to promote Mola is the identification of the availability of mola broodstock for stocking in the ponds. Hence, the source of mola broodstock need to be identified in the project districts on priority basis.
2. Development of breeding technology for Mola and SIS to support sustainable farming of Mola and SIS and setting up Mola-SIS broodfish programme
3. A recent project of WorldFish approved and funded by GIZ Germany will work on establishing hatchery systems for SIS in Assam and Odisha to ensure steady supply of quality seed. APART project stakeholders and DOF will be invited and involved in this project inception, planning and implementation
4. The technology need to be scaled-up in polyculture ponds, paddy-fish integrated farms and beels in all clusters during 2020-21 towards scaling up the technology already demonstrated.
5. Partial harvesting of mola every fortnight after a latency period of 3 months from stocking for regular consumption and to market excess mola-SIS produced.

D7: Improving impact of aquaculture and beel fisheries on human nutrition

WorldFish is promoting the consumption of fish particularly small fishes rich in micronutrients among the vulnerable sections of the population including pregnant and lactating women and young children. WorldFish has promoted nutrition sensitive aquaculture activities under the project to produce nutrient rich small fishes along with carps in pond aquaculture, paddy-fish integrated farming and beels.

Based on the study conducted in Assam and also with the experience of WorldFish in other countries and in Odisha, nutritious fish based products like fish powder and fish chutney have been identified for piloting and demonstration to increase consumption by target groups.

It is also proposed to provide nutritional education among the local communities to promote consumption of SIS particularly for the first 1000 days for pregnant women, lactating mothers and minor children. During the reporting period, WorldFish discussed with the IEC and Communication Team of ARIAS Society and developed Social Behaviour Change Communication (SBCC) products to be used under the APART Project.

There is need for convergence of many departments including Social Welfare, Health, Education etc. and NGOs to promote the consumption of fish for nutritional well-being.

Recommendations:

1. Organise awareness programs among rural communities on health benefits of fish consumption.
2. Promote consumption of fish particularly small fishes which are rich in micro nutrients.
3. Initiate discussions with social welfare department to include fish in the mid-day meal program of schools and Anganwadis and through ICDS and Poshan Abhiyaan programs of the government based on the lessons learned in WorldFish project in Odisha
4. Social media campaign for promoting consumption of fish

D8: Promoting climate resilient smart fish production technologies:

WorldFish jointly with IRRI developed the BMP for Paddy cum fish integrated farming and Record book to provide technical support to the beneficiaries selected for Paddy-Fish integrated farming demonstrations in the project districts. During 2020-21, Paddy cum Fish integrated farming is demonstrated with 531 beneficiaries covering an area of 288.90 ha.

Government of Assam is considering to expand the area under paddy-fish farming as a climate resilient technology in all the potential districts of Assam to provide the farmers opportunity to overcome the losses due to floods. In this direction, WorldFish and IRRI provided necessary support to Government of Assam and identified suitable areas through GIS mapping for promoting paddy cum fish farming in Assam.

Further during the reporting period, WorldFish has taken up the Study on Climate resilient technologies to support pond aquaculture and beel fisheries. WorldFish Climate Change Expert consulted with ARIAS, DOF and COF teams on the methodologies and tools of the study and visited the project districts to collect required information on the climate resilient technologies demonstrated by the project, climate resilient technologies practiced by the

farmers and fisherfolk, indigenous technical knowledge on climate resilient technologies through qualitative and quantitative methods. The study is in progress and will be completed and report submitted to ARIAS and DOF before June, 2021.

Recommendations:

- Expansion of area under Paddy-fish integrated farming in the project districts
- Mapping and ground trothing of low lying flood prone areas having potential for paddy-fish integrated farming in Assam
- Awareness creation among the paddy farmers from potential areas to practice scientific paddy fish farming to increase production, employment and income

D9: Gender transformative approaches in support of sustainable aquaculture and beel fisheries

APART Project has a target of benefiting at least 30% of women farmers through their participation in the interventions. To fulfil the objectives of the project WorldFish undertook a gender scoping study along with ARIAS and DoF in the selected project districts to identify gaps and entry points for interventions to be more inclusive for women. This was followed by a Gender Integration Workshop organised by ARIAS, WorldFish and Royal Tropical Institute, Netherlands. Based on the outcome of the stakeholder consultations, gender scoping study and Gender integration workshop conducted, WorldFish gender team has provided Gender Integration Recommendations for the Fishery sub-component of the APART Project to ARIAS Society and DOF for implementation during 2020-21.

During the reporting period, women participation in fishery sub-component has improved than the previous years and it was observed that there was around 20% women among the beneficiaries of various demonstrations and in BDMCs whereas the participation of the women increased to 35% as the trainings were conducted at the village level which helped the women to participate. A report of the Gender Scoping Study in selected districts of Assam is prepared with details of the community profile of the beel user communities and pond aquaculture communities which will help to reorient gender integration activities of the project.

Recommendations:

- Gender Integration Recommendations provided by WorldFish have to be implemented by ARIAS, DOF and COF in the fishery sub-component of the project to achieve gender outcome targets.
- Furthermore, the value chain study findings need to be used to enable targeting for women to participate in other value chain activities beyond production.
- Despite women's interest to engage/actively participate in various nodes of the fish value chain, social barriers/norms were reported to restrict them from doing so. These challenges need to be understood both from the women's and men's point of view and addressed in consultation with experts through gender integration approaches.
- Women beneficiaries' role in decision making related to production and marketing activities need to be strengthened by involving them in awareness programs, trainings, meetings etc.
- Building the gender capacity of DOF officials and other project staff regularly is essential to have better understanding of gender approaches in implementation of the project.

D10: Capacity building of DOF Officials and APART Project Staff:

Capacity building of the officials of DOF and the APART staff is a major responsibility of WorldFish in the project.

During the reporting period, due to Covid-19 pandemic situation and restrictions for travel and organising trainings/meetings etc. capacity building of DOF officials and project staff through exposure visits, trainings and ToT programs could not be taken up and targets will be completed once the situation is normal for conducting regular activities. However, WorldFish has organised the following capacity building activities:

Virtual Meetings/Discussions/Trainings/Workshops:

WorldFish experts and Resident consultant provided virtual support for the implementation of project interventions by providing necessary technical support to ARIAS, DOF and COF. Virtual training on Biosecurity and Disease Management was provided during October, 2020 in which DOF officials and APART Project staff participated. Further during the reporting period virtual training on fish feed formulation along with CIFA, virtual meeting on climate resilient technologies study in Assam, Covid-19 impact study in fisheries activities of Assam and Odisha, virtual discussion on beel fisheries development under APART and Inception workshop of Climate resilient technologies study were also organised and participated by WorldFish experts.

Focus Group Discussion on BMPs with Farmer Producer Groups:

WorldFish along with COF and DOF has organised Focus Group Discussion on Better Management Practices for the Farmer Producer Groups of Fisheries component in the APART Project Districts. The objective of the FGD is to train the FPG members including beneficiaries and non-beneficiaries of the APART Project on the BMP guidelines to be followed for sustainable increase in production and productivity. During the period, 11 FGDs were conducted in 7 districts in which 332 beneficiaries and non-beneficiaries including 112 women participated.

+ Recommendations:

- + Training Modules for the beneficiaries and non-beneficiaries to focus more on the APART Project interventions.
- + Training of Trainers (TOT) program to be organized twice every year under the project by College of Fisheries to develop of pool of trainers as resource persons to conduct the training programmes under the project and to train them on the APART Project activities.
- + Exposure visits of the farmers within and outside the state has to be organized to help them in cross learning from the experiences of progressive farmers
- + National and International Exposure visit and Training of the DOF officials and Project staff would help to enhance their technical capacity to implement the project.

6. OUTCOMES, IMPACT AND SUSTAINABILITY

The outcomes and impact of the various interventions by WorldFish towards the deliverables under the project is summarised below:

Deliverables	Work Done during October 2020 to March, 2021	Overall, from Aug 2018 to September, 2020
D1: Promoting adoption of BMPs for sustainable intensification aquaculture	2 new BMPs developed for Polyculture of carps with Freshwater Prawn and Genetically improved Strains in Polyculture	In total 5 BMPs developed and disseminated to 5000 beneficiaries and non-beneficiaries. 7 BMP trainings conducted
D2: Up-gradation of Existing Indian major carp hatcheries to produce certified seed	Upgradation of 5 hatcheries to produce certified seed. Tagging of Broodstock collected from wild	5 Department hatcheries upgraded. Seed Production taken up in 3 hatcheries during 2019-20. Domestication of wild broodstock and tagging
D3: Multiplication Centres (MCs) for genetically improved fish strains	Procurement and stocking seeds of genetically improved strains of Jayanti rohu and Amur carp from NFFBB	Establishment of 4 Multiplication Centres for genetically improved strains. Procurement and stocking seeds of genetically improved strains of Jayanti rohu and Amur carp from NFFBB
D4: Improving productivity of Beels	20 Beels covering 370 ha selected during 2020-21 for development	16 Beels covering 300 ha selected during 2019-20 and 20 Beels covering 370 ha selected during 2020-21 for development. BMP for Beel Fisheries developed and communicated.
D5: Improving Fish Value Chains	5 Farmer Producer Companies in Fisheries identified by ARIAS, DOF and Service Provider and	Fish Value chain, Fish Feed Value Chain and Scoping Study in Assam completed, and Value chain gaps

	supported to identify the activities of FPCs	identified. Report submitted
D6: Carp-Mola polyculture	Supported DOF for scaling up Plan during 2020-21. Proposed to bring 50 ha Polyculture, 300 ha Paddy-Fish farming and 500 ha Beel for stocking of Mola-SIS. 11 BMP trainings provided	Created awareness on Mola-SIS farming with carps with stakeholders. DOF officials and Project staff trained in Carp-Mola-SIS farming. BMP for production of Mola-SIS with Carps and Record Books distributed to farmers and 7 BMP trainings conducted so far. Demonstrations taken up with 64 beneficiaries covering 21.85 ha in 10 project districts during 2019-20
D7: Improving impact of aquaculture and beel fisheries on human nutrition	Nutrition sensitive aquaculture activities promoted in pond aquaculture, paddy-fish farms and beels. SBCC materials prepared for Social media campaign to promote fish nutrition. Identified fish powder and fish chutney as affordable nutritious fish-based products for piloting and promotion.	DOF, ARIAS and COF staff and farmers sensitised on health benefits of fish consumption. Study conducted to understand the consumption behaviour, scope for value added products production, marketing, and consumption in Assam.
D8: Promoting climate resilient smart fish production technologies	Provided support for Paddy-fish farming demonstrations with 531 beneficiaries covering 288.90 ha during 2020-21. Study on Climate Resilient Technologies for pond aquaculture and beel fisheries conducted.	Climate resilient paddy fish integrated farming demonstrated with 91 farmers (50 ha) during 2018-19 and 206 farmers (100 ha) during 2019-20. WorldFish and IRRI jointly supported the Government of Assam in identifying additional area for the expansion of climate resilient Paddy cum fish farming in Assam
D9: Gender transformative approaches in support	Gender Scoping Study Report completed along with community profile of	DOF, ARIAS and COF sensitised on gender integration in the fisheries

of sustainable aquaculture and beel fisheries	beel fisheries and pond aquaculture communities in selected districts of Assam	activities. Gender Scoping study and Gender Integration Workshops were conducted. Provided Gender Integration Recommendations to DOF and ARIAS.
D10: Capacity building of DoF Officers	Virtual trainings, meetings and discussions arranged along with DOF, COF, ARIAS officials and Project staff. 11 BMP trainings conducted for the FPGs.	Workshops, Trainings, Write-shop, and Meetings conducted, TOT provided, Exposure visits facilitated under the project to build the capacity of DOF, ARIAS, COF and APART staff. Virtual trainings, meetings and discussions arranged for the DOF, COF, ARIAS officials and Project staff. 6 FGDs conducted for the FPGs.

7. TEAM DEPLOYED

Sl.No.	Name and Functional Title	Area of Expertise	Position Assigned
1	Michael J Philips, Director of Aquaculture & Fisheries Sciences	Aquaculture	International Expert
2	Chadag V Mohan, Principal Scientist	Aquaculture	International Expert
3	Benoy Kr. Barman, Senior Scientist	Small Scale Fisheries	International Expert
4	Jharendu Pant, Senior Scientist	Aquaculture Systems	International Expert
5	Shakuntala Thilsted, Research Program Leader, Value Chains and Nutrition	Nutrition	International Expert
6	Cynthia McDougall, Senior Scientist	Gender	International Expert
7	Arun Padiyar, Scientist	Value Chain & Marketing	International Expert
8	Trin Trong, Scientist	Genetics	International Expert
9	Shwu Jiau, GIS and Database Expert	GIS	International Expert
10	Rajendran Suresh, Project Coordinator	Project Management	National Expert
11	Surendran Rajaratnam, Gender Specialist	Gender	Additional Non-Key Expert
12	Pincus Lauren, Scientist	Nutrition	Additional Non-Key Expert
13	Manos Kumar Saha, Scientist	Aquaculture	Additional Non-Key Expert
14	Rodrigue Yossa, Scientist	Fish Feeds & Nutrition	Additional Non-Key Expert
15	Bimal Kinkar Chand	Climate Change	Additional Non-Key Expert

8. WORLD BANK MID-TERM REVIEW MISSION

World Bank Mid-Term Review Mission of the APART Project was held during the period from 14th to 21st December 2020 through virtual WebEx Meetings as per the Schedule (**Annexure 8**). World Bank Mid-Term Review Mission is an important milestone of the APART Project for reviewing the work done since inception and to make necessary mid-term corrections and restructuring of the project to achieve the targets as per PAD. On 14th December 2020, the start-up meeting was attended by Dr. Bekzod and World Bank Mission Team, Shri. Rajesh Prasad, APC, Shri. Vinod Sheshan, SPD and ARIAS Team, Secretaries and Directors of the line departments, International Agencies and Service Providers. During the meeting the progress of the APART Project activities since inception to November 2020 under the different components and sub-components of the project was presented and discussed. Further the World Bank Mission was also appraised of the action taken for the earlier World Bank Mission.

Followed by the presentations by Agriculture Department, Horticulture Department and Assam Agricultural University presentation was made by the Fisheries Department by the Nodal Officer, APART and Director of Fisheries and WorldFish represented by Dr.C.V. Mohan, Project Leader and Dr. R. Suresh, Resident Consultant. During the interactions, Mission team felt that the seed and Feed are the important inputs which need to address for sustainable aquaculture and fisheries. Further the economic analysis of the various interventions in fisheries have to be taken up to know the profitability to the farmers. The Mission stressed the need to establish Farmers Producer Companies (FPCs) in fisheries with an overall target of 22 FPCs and to establish at least 5 FPCs on priority basis. Mid-Term Review Mission appreciated the overall performance in Fisheries sub-component and the role played by WorldFish in providing technical support for the project was highlighted.

On 19th December 2020, Mini-Mission to review the Fisheries Activities was held in which the Mission members, Fishery Coordinator and ARIAS Team, Director of Fisheries, Nodal Officer from Department of Fisheries, Dr.C.V. Mohan, Shri.Nirmallya Mandal and Dr.R. Suresh from WorldFish participated. During the meeting, WorldFish activities in the APART Project to provide technical support for the fishery sub-component since inception was presented by Dr. R. Suresh, Resident Consultant. (**Annexure 9**). Mission team members discussed the Fish Value Chain Study conducted by WorldFish, potential for freshwater prawn farming in Assam, Hygienic fish marketing by FishFed. Dr.C.V. Mohan explained the Nutritious pond concept demonstrated by WorldFish in Bangladesh. Mission team appreciated the efforts of WorldFish in providing technical support to the farmers through BMPs and Record Books for the all the interventions in fisheries and informed that these extension products have to be translated to Bengali language apart from Assamese for better reach to the Bengali speaking farmers.

During the APART Project Restructuring Meeting, WorldFish proposal for additional budget towards additional manpower and vehicle was presented and was approved by the Mission in-principle.

On 21st December 2020, the Mini-Mission for Social Sector was conducted in which World Bank Social Sector Team and ARIAS Social Sector coordinator discussed with the OPIUs and International Agencies on the need for better gender integration in the project and to

suggest indicators in results framework. Gender sensitization, Gender scoping study, Gender Integration Workshop and Gender Recommendations provided by WorldFish for the fishery sub-component presented by Dr.R. Suresh, Resident Consultant was appreciated by the Mission.

The Wrap-up meeting of the World Bank Mid-Term Review Mission was attended by Dr. Bekzod, TTL and World Bank Mission Team, Chief Secretary, Principal Secretary & APC, Secretaries, Commissioners and Directors of participating Departments, Government of Assam, International Agencies and Service Providers. During the meeting Dr. Bekzod, TTL gave a presentation on the observations of the Mission and discussed the next steps to achieve the project objectives. Chief Secretary, Government of Assam assured all possible assistance of the Government for the Project.

Follow-up:

Based on the discussion during the World Bank Mid-Term Mission, a detailed proposal for an additional budget of 282,802 USD towards engagement of three national non-key experts and for vehicle hiring charges was prepared and submitted to ARIAS on 13th March 2021.

9. DETAILS OF WORK DONE AND OUTPUTS

Project Activities	Work Done (October 2020 - March 2021)	Outputs (if any)
Deliverable 1. Promoting adoption of BMPs for sustainable intensification of aquaculture		
Activity 1: Analysis of current practices		
Activity 2: Organizing workshop for sensitization of PIU officers		
Activity 3: Designing technical plans for taking up demonstrations for application of BMPs for doubling fish production	Technical plan for taking up demonstrations of Polyculture of carps, Polyculture of carps with Mola-SIS, Polyculture of carps with Freshwater prawns, paddy-Fish integrated farming with Mola-SIS, Carp Polyculture with genetically improved fish strains and Beel fisheries development for application of BMPs provided to DOF	5 BMP guidelines and 2 draft BMP guidelines
Activity 4: Demonstration for application of BMPs for doubling fish production	Conducted 11 Focus Groups Discussion with the farmers in which 332 farmers were trained on application of BMPs. Demonstrations of Polyculture of carps, Polyculture of carps with Mola-SIS, Polyculture of carps with Freshwater prawns, paddy-Fish integrated farming with Mola-SIS and Beel fisheries during 2020-21	FGD Training Report
Activity 5: Development of scaling up approach for wider dissemination of BMPs	Scaling up plan for dissemination of BMPs among Non-beneficiaries by distribution of BMP guidelines, Pond record books and BMP trainings	5 BMP guidelines and 5 Pond record books
Activity 6: M&E of technical demo programs	Analyses will be carried out upon Completion of 2019-20 end of demonstration survey and 2020-21 baseline survey.	Survey formats in KOBO Toolkit for Baseline and Endline survey of demonstrations.
Activity 7: Preparation of technical reports		

Deliverable 2: Up-gradation of Existing Indian major carp hatcheries to produce certified seed		
Activity 1: Baseline survey		
Activity 2: Development of up-gradation plan for hatcheries		
Activity 3: Preparation of Guidelines for identification of sources of quality brood stock & site visits	Supported DOF for collection of improved strain, Jayanti rohu from ICAR-CIFA	
Activity 4: Up-gradation of hatcheries & its operationalization	Upgradation of 5 existing hatcheries including bio security Three hatcheries operationalised and produced IMC seeds	
Activity 5: Development of scientific breeding programme & its up-date	Scientific breeding programme by using the Broodstock from natural collection for Quality Seed Production by the hatcheries developed in consultation with DOF	
Activity 6: Development SOPs, BMPs, quality assurance programme		
Activity 7: Capacity building of hatchery operators (no of hatchery operators/ hapa breeders/ seed growers)		
Activity 8: M&E to document the impact		
Activity 9: Preparation/production of report		

Deliverable 3: Multiplication Centres (MCs) for genetically improved fish strains		
Activity 1: Survey to assess the demand for genetically improved strains of fish in project areas	Demand for improved strains of fish by hatcheries and farmers were assessed during the field visits and during discussion with DOF officials, hatchery operators and	
Activity 2. Selection of public seed farms to set up Multiplication Centers (MCs) using sound technical design to produce genetically improved strains		
Activity 3: Develop plan to set up MCs in public farms for production and dissemination of genetically improved strains		
Activity 4: Setting up of MCs following technical design and commissioning for operationalization	Establishment of 4 multiplication centres with hatchery infrastructure, breeder pond, nursery facilities and biosecurity completed	
Activity 5: Capacity building of the staff and Managers about operation and management of MCs	Training provided to hatchery operators and Project staff on tagging of brood fishes	Tagging Training Report
Activity 6: Develop SOPs, BMPs, Biosecurity measures to produce certified seed of genetically improved strains	BMP for quality seed production provided SOP for Tagging of Brood Fishes provided	BMP for quality seed production SOP for Tagging of Brood fishes
Activity 7: Procurement of genetically improved strains of fish (e.g. Joyantirohu) from ICAR-CIFA	Supported DOF to Procure genetically improved strain Jayanti rohu and Amur Carp from NFFBB, Bhubaneswar	
Activity 8: Preparation of BMP manual for adoption of genetically improved fish strains by hatcheries and farmers	Draft BMP manual for genetically improved fish strains stocking in polyculture prepared	Draft BMP manual
Activity 9.: M&E to document the quality of fish produced and the and impact		
Activity 10.: Preparation of reports		
Deliverable 4: Improving productivity of beels		

Activity 1: Identification of beel fisheries for project intervention	20 Beels covering 369.62 ha from 8 project districts were selected to implement activities during 2020-21.	
Activity 2: Community mobilization and formation of Beel Development and Management Committee (BDMC)	Community mobilization for formation of Beel Development and Management Committee (BDMC) were taken up in all the beels selected for development during 2020-21.	
Activity 3: Development of FGD guidelines and beel governance mechanisms	Beel governance guidelines provided in the BMP guidelines	BMP for Beel Fisheries
Activity 4: Formulation of scientific interventions strategy, SOP, better management practices & its up-dating	Scientific and technical intervention strategy and better management practices developed and provided as BMP for Beel Fisheries	BMPs for Beel Fisheries
Activity 5: Development of technical training manual & its up-dating		
Activity 6: Demonstration of scientific interventions	Scientific interventions initiated in 14 out of 16 beels selected during 2019-20	
Activity 7: M&E to document the impact		
Activity 8: Strategy formulation for scaling up operation		
Deliverable 5: Improving Fish Value Chains		
Activity 1: Fish value chain analysis to identify opportunities to enhance efficiency of value chains		
Activity 2: Fish Feed Value Chain Study [Annex-1 of TOR]		
Activity 3: Developing strategies for increasing benefits to fish producers, consumers and small enterprises associated with production, processing, food safety and marketing of fish	Strategies based on the Fish value chain study findings discussed with ARIAS, DOF and Service Providers for increasing benefits to the fish producers, consumers and development of small enterprises associated with production, processing and marketing of fish.	Fish Value Chain Study Report

Activity 4: Support to service providers in establishment and operationalization of farmer producer organizations (FPOs) and common service centers (CSCs)	Supported ARIAS, DOF and Service providers in establishment and operationalization of 5 FPCs in fish value chain and identified potential activities for the FPCs	
Activity 5: Technical reports and publications		
Deliverable 6: Carp-Mola polyculture		
Activity 1: Sensitization of stakeholders through FGD	Sensitization of stakeholders through FGD and BMPs for Polyculture of carps with Mola and SIS taken up project districts 11 FGDs were conducted among the FPGS in the selected clusters of project districts and 322 stakeholders provided training on BMPs for Polyculture of carps with Mola and SIS	FGD Report
Activity 2: Development of TOT manual for DoF & CoF officials		
Activity 3: Conduct TOT		
Activity 4: Setting up carp-mola/ SIS broodfish programme	Identified sources of mola and other SIS broodfish in many of the project districts Large ponds and beels located within the clusters already identified as good sources of mola and other SIS broodfish. Polyculture demonstration ponds stocked with mola and - SIS to serve as a source of mola-SIS broodstock in the coming years	
Activity 5: Demonstration of POP and BMPs for carp-mola/SIS polyculture farming systems	Carp-Mola-SIS Polyculture demonstrations in 50 ha with 150 beneficiaries, 300 ha of paddy-fish farming and 500 ha beel is in progress 11 FPG level FGDs were conducted and the BMPs for Carp-Mola-SIS polyculture explained to the beneficiaries for adoption	FGD Report
Activity 6: M&E to document the impact		
Activity 7: Designing strategy for scaling up operation		

Activity 8: Scaling up demonstrations		
Activity 9: Technical reports and science report preparation		
Deliverable 7: Improving impact of aquaculture and beel fisheries on human nutrition		
Activity 1: Study on scope and applicability of value addition, marketing and consumption of fish and fish products in Assam [Annex-3 to TOR]		
Activity 2: Stakeholder mapping exercises for identification of development partners promoting human nutrition		
Activity3: Demonstration on nutrition sensitive aquaculture and beel fisheries programs	Demonstration on nutrition sensitive aquaculture and beel fisheries programs have been initiated during 2020-21 and so far 1546 ponds have been stocked with Carps, Carp-Mola-SIS and Freshwater prawns along with carps apart from 531 demonstrations in 289 ha developed for paddy-fish farming along with Mola-SIS and 20 beels covering 370 ha	
Activity 4: Development of “first 1000 days” nutrition programs through inclusion of fish and fish products in diets & development of nutrition education programs		
Activity 5: Piloting development of affordable nutritious fresh fish and fish based products		
Activity 6: Capacity building of identified stakeholders for nutrition programme activities		
Activity 7: Demonstration on production of affordable nutritious fresh fish and fish-based products		

Activity 8: Development of module for social behavior change approaches to increase consumption of nutritious fish		
Activity 9: Workshop on social behaviour change to increase consumption of nutritious fish		
Activity 10: Demonstration on nutrition sensitive aquaculture programme		
Activity 11: M&E to document the impact		
Activity 12: Technical reports and science report preparation		
Deliverable 8: Promoting climate resilient smart fish production technologies		
Activity 1: Study of Climate Resilient Technologies/ Practices to Support Pond Aquaculture and Beel Fisheries [Anex-2 of TOR]	Study of Climate Resilient Technologies/ Practices to Support Pond Aquaculture and Beel Fisheries is in progress. Climate resilient technologies demonstrated in the project, Climate resilient practices adopted by the fishers and farmers and indigenous technical knowledge on climate resilient technologies and practices are taken up through qualitative and quantitative methods	
Activity 2: Workshops on existing climate resilient practices adopted by farmers		
Activity 3: Formulation of strategies on different climate smart/resilient aquaculture production technologies and farming systems	Paddy-cum Fish farming and short duration fish culture as Climate smart technological intervention options to manage climate risks or adopt to climate change effects on pond aquaculture are identified Strategies for promotion of different climate smart/resilient production technologies discussed with ARIAS, DOF and COF WorldFish and IRRI working jointly to identify suitable areas in Assam for the expansion of Paddy cum fish farming in low lying paddy fields inundated by frequent floods.	

Activity 4: Discussion with IRRI to finalize detailed technological issues on rice-fish farming for demo. programme	WorldFish Experts regularly discuss with IRRI under APART on technical interventions in paddy fish farming.	
Activity 5: Demonstration on rice-fish integrated farming systems	Demonstrations on rice-fish integrated farming systems are initiated with by 516 farmers in 289 ha during 2020-21.	
Activity 6: Demonstration of monoculture (M) and poly-culture (P) technologies with genetically improved fish strains	During 2020-21 it is proposed to conducted demonstrations in 50 ha involving 150 farmers by using improved fish strains of Jayanti rohu and Amur carp.	
Activity 7: Demonstration of small indigenous fishes with carp culture	Demonstration of paddy-fish integrated farming systems during 2020-21 in 300 ha. by stocking Mola-SIS at the rate of 25 kg/ha recommended to DOF	
Activity 8: Refinement of PoPs		
Activity 9: M&E to document the impact		
Activity 10: Technical Reports and Science report preparation		
Deliverable 9: Gender transformative approaches in support of sustainable aquaculture and beel fisheries		
Activity 1: Gender Scoping (Understanding the context with regards to gender norms and practices in selected sites)	Gender Scoping study report based on the results of the study conducted with beel user communities and pond aquaculture communities in selected districts of Assam to understand the context with regard to gender norms and practices completed	Gender Scoping Study Report
Activity 2: Gender Assessment (Assessing the Assam APART-WorldFish research across the deliverables to identify opportunity and challenges to enable women to equally access and benefit from the project's intervention)		
Activity 3: Gender Integration (Demonstration of gender integration strategy in APART-WorldFish research in pond and beel fisheries)		
Activity 4: Piloting GTA in selected pond and beel fisheries site		

Activity 5: Gender M & E Conducted pre & post-gender integration as well as pre & post-GTA.		
Activity 6: Technical reports and science report preparation		
Deliverable 10: Capacity building of DoF Officers		
Activity 1: Designing capacity building programs/ training module/prepare training literature for DOF officers on (a) BMPs for sustainable intensification of aquaculture (b) carp-mola/SIS polyculture (c) climate resilient aquaculture (d) post-harvest technologies (e) value addition (f) food safety issues		
Activity 2: Conducting TOT & exposure visit of DOF officers	Could not be taken up due to Covid-19 pandemic restrictions and guidelines	
Activity 3: Designing capacity building programme/ preparation of training module/ literature for training & exposure of farmers/ fishers	Provided support to DOF and COF in designing and organizing Capacity development programs at FPG level during 2020-21.	
Activity 4: Conducting training & exposure visit of farmers/ fishers/hatchery operators/ seed growers/ fish processors/ market players	Jointly conducted the training programmes for farmers along with COF and DOF. 11 Focus Group Discussions were conducted in 7 districts in which 332 farmers participated.	Training report

10. TECHNICAL INPUTS OF NATIONAL RESIDENT CONSULTANT

Sl.No	Date	Official Met/Meeting Attended	Purpose
1	07.10.2020	SPD, Dr.Sanjay Sarma, Fishery Coordinator Dr. D.J. Sharma, Nodal Officer Er.Sreemant Phukan, M&E Specialist	SPD Review of the Fishery component of APART
2	07.10.2020	Dr. Bekzod, TTL, World Bank and Team, SPD and ARIAS Team, OPIU, International Agencies	World Bank Review Meeting of APART Project Activities
3	07.10.2020	Dr.Sanjay Sarma, Fishery Coordinator	APART Project works,M&E Data collection and SPD Review
4	08.10.2020	Dr.Ashim Bora, Sr.Executive, NFDB	NFDB Brood Bank and Quality seed production
5	09.10.2020	Dr.Sanjay Sarma, Fishery Coordinator	APART Project activities, Beel selection, Quality seed production
6	10.10.2020	Dr.Sanjay Sarma, Fishery Coordinator	SPD visit to Nalbari and Virtual Training on Biosecurity and Fish Disease Management by Dr.C.V.Mohan
7	16.10.2020	Ms. Tarali, Mr.Pankaj Bezbarua, Grant Thornton, Dr.Sanjay Sarma, Fishery Coordinator, Mr. Nirmallya Mandal	Dry fish Enterprise development Virtual Meeting by Grant Thornton
8	18.10.2020	Dr.Sanjay Sarma, Fishery Coordinator	APART Project works, Freshwater prawn farming and paddy-fish farming demonstrations
9	21.10.2020	Mr.Pankaj Bezbarua, Grant Thornton	Dry fish Enterprise development, Training Module & Resources
10	03.11.2020	Dr.Gens Kahle, Dr.Gens Windel, Ms. Stepahnie, Dr.Deepak Chamala, GIZ Dr.C.V.Mohan, worldfish	GIZ Project Appraisal Meeting, APART WorldFish Activities
11	05.11.2020	Dr.Bhavani Shankar, MSSRF	WorldFish activities in Assam & WorldFish Research Strategy

12	06.11.2020	Dr.C.N.Ravishankar, Director, CIFT	WorldFish activities in Assam & WorldFish Research Strategy
13	07.11.2020	Dr.P.Paul Pandian, FDC, MOF, GOI	WorldFish activities in Assam & WorldFish Research Strategy
14	08.11.2020	Dr. D.J. Sharma, Nodal Officer	WorldFish activities in Assam & WorldFish Research Strategy
15	08.11.2020	Dr.Sanjay Sarma, Fishery Coordinator	WorldFish activities in Assam & WorldFish Research Strategy
16	10.11.2020	Dr.Sanjay Sarma, Fishery Coordinator	WorldFish activities in Assam – Beel selection, Carp-Mola-SIS farming
17	11.11.2020	Dr.Sebastian Mathew, Executive Secretary, ICSF	WorldFish activities in Assam & WorldFish Research Strategy
18	19.11.2020	Dr.Srivalli Krishnan, BMGF	WorldFish activities in Assam & WorldFish Research Strategy
19	20.11.2020	Dr.Sanjay Sarma, Fishery Coordinator	WorldFish activities in Assam – Freshwater prawn farming, Brood fish Tagging Training
20	26.11.2020	Dr.Sanjay Sarma, Fishery Coordinator	WorldFish activities in Assam – World Bank Mid-Term Review, Minister of Fisheries Review of APART activities
21	01.12.2020	Dr.Sanjay Sarma, Fishery Coordinator	WorldFish activities in Assam –SPD Review, Secretary Review, Minister of Fisheries Review of APART activities
22	01.12.2020	Dr.Sanjay Sarma, Fishery Coordinator	WorldFish activities in Assam –Brood fish tagging Training, seed Production Training in CIFA for DOF officials
23	01.12.2020	Dr.Sanjay Sarma, Fishery Coordinator	WorldFish activities in Assam –Fish in School feeding Program
24	05.12.2020	SPD, Dr.Sanjay Sarma, Fishery Coordinator, Dr. D.J.Sharma, Nodal Officer, Er.Sreemant Phukan, M&E Specialist, Mr. Shameen B. Laskar, Ste Program Manager, Mid-day Meal Scheme	Introduction of fish in the mid-day meal program in schools

25	07.12.2020	Dr.Sanjay Sarma, Fishery Coordinator	Brood fish tagging Training, seed Secretary Meeting, Minister of Fisheries Review of APART activities
26	07.12.2020	Mr. Probin Borali, Cluster Coordinator, Mr. Nitin, Dr. Sanjay Sarma	Formation of FPCs in fisheries
27	07.12.2020	Dr.Baljeet Singh, Marketing Specialist	World Bank Mid-Term Review WorldFish Restructuring Proposal
28	10.12.2020	Mr.Rakesh Kumar, Secretary and Commissioner of Fisheries, Dr.N.K.Nath, Director of Fisheries,, Dr.Sanjay Sarma, Fishery Coordinator, Dr. D.J.Sharma, Nodal Officer	World Bank Mid-Term Review- APART fishery activities
29	11.12.2020	Dr. Bekzod, TTL, World Bank and Team, Mr. Rajesh Prasad, APC, Mr.Vinod Seshan, SPD and ARIAS Team, OPIU, International Agencies	World Bank Consultation Meeting of APART on Agricultural Regulations
30	12.12.2020	Mr. Parimal Suklabadya, Minster for Fisheries, Mr.Rakesh Kumar, Secretary and Commissioner of Fisheries, Dr.N.K.Nath, Director of Fisheries,, Dr.Sanjay Sarma, Fishery Coordinator, Dr. D.J.Sharma, Nodal Officer, DOF officials and APART Staff	FishFed Hygienic Retail Outlet Inauguration, Mobile APP for fish marketing and Review of APART activities
31	14.12.2020	Dr. Bekzod, TTL, World Bank and Team, Mr. Rajesh Prasad, APC, Mr.Vinod Seshan, SPD and ARIAS Team, OPIU, International Agencies, Dr.C.V.Mohan, WorldFish	World Bank Mid-Term Review
32	14.12.2020	Dr. D.J.Sharma, Nodal Officer Dr.Sanjay Sarma, Fishery Coordinator, Er. Sreemant Phukan, M&E Specialist	APART Project works, World Bank Mid-Term Review in Fisheries, Economic Analysis of Fisheries Demonstrations
33	16.12.2020	Dr.Kanwar Singh, RC, IRRI	World Bank Mid-Term Review, Paddy-Fish Farming- Economics

34	18.12.2020	Dr.Kanwar Singh, RC, Ms. Suranjana Bora, GIS Expert, IRRI	Paddy-Fish Farming- Expansion of Potential Area in Assam identification using GIS
35	18.12.2020	Dr.Sanjay Sarma, Fishery Coordinator,	Economic Analysis of Fisheries Demonstrations
36	19.12.2020	Dr. Arvind Jamb,World Bank and Team, Dr.N.K.Nath, Director of Fisheries,, Dr.Sanjay Sarma, Fishery Coordinator, Dr. D.J.Sharma, Nodal Officer, Dr.C.V.Mohan, WorldFish, Mr. Nirmallya Mandal, WorldFish	World Bank Virtual Review Meeting of Fisheries activities under APART
37	20.12.2020	Dr. Bekzod, TTL, World Bank and Team, Chief Secretary, Mr. Rajesh Prasad, APC, Secretaries, Mr.Vinod Seshan, SPD and ARIAS Team, OPIU, International Agencies	World Bank Mid-Term Review – Wrap-up meeting
38	21.12.2020	Dr. Mridula, Ms. Philarasia, World Bank, Ms. Arpana Barman, Social Sector Coordinator, International Agencies	World Bank Mid-Term Review- Social Sector
39	22.12.2020	Dr. D.J.Sharma, Nodal Officer	World Bank Mid-Term Review, APART project works
40	09.01.2021	Dr.Sanjay Sarma, Fishery Coordinator	FPC formation in Fisheries –List of Activities
41	12.01.2021	Dr.Sanjay Sarma, Fishery Coordinator, Dr. Baljeet, Marketing Specialist, Dr. Rupam Borgoin, Nodal Officer, AAU, Dr. Kalita, Dean, CoF, Dr. P.C. Bhuyan, Coordinator, Dr. Kanwar Singh, RC, IRRI	Fish Knowledge Bank Preparation in APART
42	06.02.2021	Dr. Das, Veterinary &AH Coordinator	Livestock Exhibition arrangements in Guwahati
43	09.02.2021	Dr.Bimal Chand, Dr. Atanu Chatterjee, environmental specialist, Mrs. Arpana Barman, Social Sector Specialist, Dr.Sanjay Sarma, Fishery Coordinator	Climate Resilient Technologies Study- Stakeholder consultation with ARIAS

44	09.02.2021	Dr.Bimal Chand, Dr. Kanwar Singh, RC, Ms. Suranjana Bora, GIS Expert, IRRI	Climate Resilient Technologies Study- Climate Change vulnerability in Assam
45	10.02.2021	Dr.Baljeet Singh, Marketing Specialist	World Bank Mid-Term Review WorldFish Restructuring Proposal
46	10.02.2021	Dr.Bimal Chand, Dr. Kalita, Dr.Borthakur, Dr.Buyan, CoF	Climate Resilient Technologies Study- Stakeholder consultation with COF
47	10.02.2021	Dr.Bimal Chand, Kalong Kopili NGO	FGD with fish farmers of Dimoria Block on Climate Resilient Technologies
48	11.02.2021	Dr.Bimal Chand, Dr.Sanjay Sarma, Fishery Coordinator, Dr. D.J.Sharma, Nodal Officer, Dr. Chandan Chetri, DOF Officials and Project Staff	Climate Resilient Technologies Study- Stakeholder consultation with DOF
49	12.02.2021	Dr.Baljeet Singh, Marketing Specialist Mr.Ranjan Das, Procurement Specialist	World Bank Mid-Term Review WorldFish Proposal for contract variation
50	15.02.2021	Dr.Sanjay Sarma, Fishery Coordinator	SPD Review of WorldFish Activities
51	16.02.2021	Mr. Akash Deep, SPD, Dr.Sanjay Sarma, Fishery Coordinator	SPD Meeting to discuss WorldFish Activities
52	17.02.2021	Dr. Suranjana Bora, GIS Expert	Paddy-Fish Farming- Expansion of Potential Area in Assam identification using GIS
53	18.02.2021	Dr.Sanjay Sarma, Fishery Coordinator and COF APART Project Team	Review of Capacity Building Programmes and Demonstrations by COF
54	19.02.2021	Dr. Ashok Bhattacharya, DR, Dr. Rupam Borgoin, NO, RCs from International Agencies	Assam Agricultural University AWP 2020-21 Annual Project Review
55	20.02.2021	Dr.Bimal Chand, TEFs and Farmers of Pub Nalbari	FGD with farmers on Climate Resilient Technologies study

56	21.02.2021	Shri.Parimal Suklabadya, Minister for Fisheries, Minister for Irrigation, ShriN.K.Nath, Director of Fisheries, Dr.Sanjay Sarma, Fishery Coordinator, Dr. D.J.Sharma, Nodal Officer, DOF and APART officials	Inauguration of Fish Multiplication Centre in Rangia
57	24.02.2021	Shri. Rajesh Prasad, APC, Shri. Akash Deep, SPD, Dr.Kanwar Singh, RC, IRRI, Dr. Rupam Borgoin, No, AAU	Rice Knowledge Bank Launch, Rice Production Manual, Booklets and Factsheets Release
58	24.02.2021	Dr.Kanwar Singh, RC, IRRI, Dr. Rupam Borgoin, No, AAU, Dr.Sanjay Sarma, Fishery Coordinator, Dr. D.J.Sharma, Nodal Officer, Dr. Baljeet singh, Marketing Specialist	Fish Knowledge Bank
59	25.02.2021	Shri. Akash Deep, SPD Dr. D.J.Sharma, Nodal Officer Dr.Sanjay Sarma, Fishery Coordinator, Dr. Baljeet singh, Marketing Specialist	SPD Review of WorldFish Activities in APART Project
60	25.02.2021	Mr. Rudra Shankar, Deloitte	Stewardship Council formation
61	01.03.2021	Dr. D.J.Sharma, Nodal Officer	Activities fishery component of APART
62	05.03.2021	Dr. D.J.Sharma, Nodal Officer	APART Review Meeting, Mola Stocking, KBOB Data collection
63	05.03.2021	Dr.Sanjay Sarma, Fishery Coordinator, Mrs. Dimple Das, Coomunication Specialist	Fish Knowledge Bank, Fish Nutrition Social media Campaign, AWP 2021-22
63	05.03.2021	Dr. D.J.Sharma, Nodal Officer Dr.Sanjay Sarma, Fishery Coordinator, APART Staff	AWP 2021-22 Preparation
64	05.03.2021	Dr. Baljeet singh, Marketing Specialist, Dr. D.J.Sharma, Nodal Officer Dr.Sanjay Sarma, Fishery Coordinator, APART Staff	AWP 2021-22 for Fisheries sub-component
65	10.03.2021	Dr.Sanjay Sarma, Fishery Coordinator	WorldFish Deliverables in AWP 2021-22

66	11.03.2021	Dr.P.C.Bhuyan, APART Project Team of COF, Dr.Sanjay Sarma, Fishery Coordinator	COF – AWP 2021-22 and Review of COF activities during 2020-21, Fish Knowledge Bank Preparation
67	11.03.2021	Dr.Baljeet Singh, Marketing Specialist	World Bank Mid-Term Review WorldFish Proposal for contract variation
		Mr.Ranjan Das, Procurement Specialist	
68	11.03.2021	Mrs. Dimple s. Das, Communication Specialist and Ms. Tantra, IEC Team	Social Media Campaign for Fish Nutrition Promotion
69	10.03.2021	Dr.P.C.Bhuyan, APART Project Team of COF, Dr.Sanjay Sarma, Fishery Coordinator	COF – AWP 2021-22 and Review of COF activities during 2020-21
70	16.03.2021	Dr.Sanjay Sarma, Fishery Coordinator	Climate Resilient Technologies in Fisheries, Fish Knowledge Bank
71	17.03.2021	Dr.Atul K. Jain, Ornamental Expert	Ornamental fish farming training under EDP in APART
72	20.03.2021	Dr.Sanjay Sarma, Fishery Coordinator	Paddy-Fish farming, Mola stocking
73	31.03.2021	Mrs. Dimple s. Das, Communication Specialist	Social Media Campaign for Fish Nutrition Promotion

B. Discussions with WorldFish Experts

Sl.No	Date	WorldFish Expert Discussed	Purpose
1	01.10.2020	Dr.C.V.Mohan	World Bank Mid-Term Review Report, 6 months report
2	06.10.2020	Ms. Neetha Shenoy	M&E of APART Project
3	08.10.2020	Dr.Arun Padiyar	WorldFish Research Strategy and APART Project activities
4	08.10.2020	Mr.Nirmallya Mandal, Mr. Kaustav	Fish Value Chain Study Report
5	08.10.2020	Dr.Arun Padiyar	Fish Value Chain Study and Climate Change Study in Assam
6	10.10.2020	Mr.Nirmallya Mandal, Mr. Kaustav	Fish Value Chain Study Report
7	17.10.2020	Ms. Neetha Shenoy	6 months Report of APART Project
8	20.10.2020	Dr.Surendran Rajaratnam	Women Empowerment Study in Assam

9	22.10.2020	Mr.Nirmallya Mandal	Fish Value Chain Study and Women empowerment study in Assam
10	22.10.2020	Ms. Neetha Shenoy	M&E of APART Project, WorldFish Strategy
11	22.10.2020	Dr.Arun Padiyar	Climate Change Study in Assam, APART Project Works
12	04.11.2020	Ms. Neetha Shenoy	M&E of APART Project, WorldFish Strategy
13	05.11.2020	Dr.John Kurien	WorldAFish activities in Assam, WorldFish Strategy
14	08.11.2020	Dr.Arun Padiyar	Climate Change Study in Assam, Women empowerment Study, APART Project Works
15	09.11.2020	Dr. Bikram	Covid-19 Impact study in Assam and Odisha
16	12.11.2020	Dr. Bimal Kinkar Chand	Climate Resilient Technologies Study in Assam
17	16.11.2020	Mr.Nirmallya Mandal, Mr. Kaustav	Women Empowerment Study in Assam
18	19.11.2020	Dr. Bimal Kinkar Chand	Climate Resilient Technologies Study in Assam
19	28.11.2020	Mr. Ravi Babu	COVID 19 Impact Study in Assam
20	28.11.2020	Dr.Surendran Rajaratnam	Women Empowerment in fisheries study and Gender Scoping study report
21	28.11.2020	Dr.Arun Padiyar	WorldFish Assam Milestones, APART Project Works
22	29.11.2020	Dr. Bimal Kinkar Chand	Climate Resilient Technologies Study in Assam
23	02.12.2020	Dr.C.V.Mohan	World Bank Mid-Term Review, Climate Resilient Technologies study
24	02.12.2020	Dr. Bimal Kinkar Chand	Climate Resilient Technologies Study in Assam – Work Plan
25	04.12.2020	Dr.Arun Padiyar	World Bank Mid-Term Review, Fish school feeding program, Cage culture
26	06.12.2020	Ms. Neetha Shenoy	APART Project Details for reporting
27	06.12.2020	Dr.Arun Padiyar	SPD Meeting for introduction of Fish in school feeding program

28	07.12.2020	Dr.Arun Padiyar	Paddy-Fish farming in Assam
29	08.12.2020	Dr.Trinh Trong	Tagging of Brood fish
30	16.12.2020	Dr. Bimal Kinkar Chand	Climate Resilient Technologies Study in Assam – Work Plan Discussion
31	20.12.2020	Dr.Arun Padiyar	APART Activities World Bank Mid-Term Review, WorldFish Restructuring Proposal
32	20.12.2020	Dr. Bimal Kinkar Chand	Climate Resilient Technologies Study in Assam – Work Plan Discussion
33	21.12.2020	Dr.C.V.Mohan, Dr. Bimal Kinkar Chand	Climate Resilient Technologies Study in Assam – Work Plan Discussion
34	05.01.2021	Dr. Bikram	Covid-19 Impact study in Assam and Odisha
35	05.01.2021	Ms. Neetha Shenoy	APART Project World Bank MTR Details for reporting
36	08.01.2021	Dr.Surendran Rajaratnam	Gender in APART, WSHG Study
37	11.01.2021	Dr. Bimal Kinkar Chand	Climate Resilient Technologies Study in Assam – Work Plan and Tools
38	18.01.2021	Dr. Bimal Kinkar Chand	Climate Resilient Technologies Study in Assam – Work Plan and Tools, Virtual Meeting
39	22.01.2021	Dr. Bimal Kinkar Chand	Climate Resilient Technologies Study in Assam – Work Plan and Tools, Meeting with ARIAS, DOF, COF and other stakeholders
40	25.01.2021	Ms. Neetha Shenoy	M&E of APART Project, WorldFish Strategy
41	28.01.2021	Ms. Neetha Shenoy	M&E of APART Project- Capacity Building Programs and Publications in 2020
42	22.01.2021	Dr. Bimal Kinkar Chand	Climate Resilient Technologies Study in Assam –Meeting with ARIAS, DOF, COF and other stakeholders
43	02.02.2021	Dr. Bimal Kinkar Chand	Climate Resilient Technologies Study in Assam –Field visit Plan and Meeting with ARIAS, DOF, COF and other stakeholders

44	08.02.2021	Dr. Bimal Kinkar Chand	Climate Resilient Technologies Study in Assam –Enumerators Training, Field visit Plan and Meeting with ARIAS, DOF, COF and other stakeholders
45	09.02.2021	Dr.Surendran Rajaratnam	Gender Strategy, Gender Policy in India, WSHG in Fisheries
46	15.02.2021	Dr.Benoy Kumar Barman	Progress of Beel Fisheries and Carp-Mola-SIS farming activities in APART
47	24.02.2021	Dr.Surendran Rajaratnam	WSHG Study, Covid Impact on women in fisheries and aquaculture
48	02.03.2021	Dr.C.V.Mohan and Finance Team, WorldFish	APART Project Budget
49	02.03.2021	Dr.Benoy Kumar Barman	Progress of Beel Fisheries and Carp-Mola-SIS farming activities in APART
50	03.03.2021	Dr. Bimal Kinkar Chand	Climate Resilient Technologies Study in Assam
51	05.03.2021	Dr.Surendran Rajaratnam	Gender scoping study report
52	09.03.2021	Dr.Arun Padiyar	APART WorldFish Activities
53	25.03.2021	Dr.C.V.Mohan	APART Project works, Climate Resilient Technologies Study, AWP for 2021-22
54	25.03.2021	Dr.Surendran Rajaratnam	Gender scoping study report, WEFI study, WSHG in fisheries
55	26.03.2021	Mr.Nirmallya Mandal	Fish Value Chain Study, WEFI Study
56	29.03.2021	Dr. C.V. Mohan, Dr. Ben Belton, Dr. Shakuntala Thilsted, Dr.Arun Padiyar	SIS Breeding Program in India
57	29.03.2021	Dr.Baishnaba Ratha	Fish Nutrition Promotion in Assam
58	29.03.2021	Dr.Arun Padiyar	APART WorldFish Activities , SIS Breeding program, Nutrition Promotion in Assam
59	30.03.2021	Dr.Pincus Lauren, Dr.Baishnaba Ratha	Planning for Fish Nutrition Promotion in Assam

11. KEY SUPPORTING DOCUMENTS

- Annexure 1. Virtual Programmes/Meetings by WorldFish Team
- Annexure 2. Report on Gender Scoping Study in Selected Districts of Assam
- Annexure 3. Impacts of COVID-19 on Aquatic Food Supply Chains in Assam
- Annexure 4. Focus Group Discussion on BMPs for Farmer Producer Groups
- Annexure 5. Draft BMP for Carp Polyculture with Genetically Improved Fish Strains
- Annexure 6. Draft BMP for Polyculture of Carps with Freshwater Prawns
- Annexure 7. Report of Training program on PIT-Tagging of Brood Fishes
- Annexure 8. World Bank Mid-Term Review Mission Schedule 14th-21st Dec 2020
- Annexure 9. WorldFish Activities in APART- World Bank MTR Presentation 14th Dec 2020

Annexure 1.

Virtual Programmes/Meetings by WorldFish Team

VIRTUAL PROGRAMMES/MEETINGS BY WORLDFISH TEAM

Sl no.	Date	Topic for the Virtual Program	Lead Speaker
1	13-10-2020	Biosecurity and Fish Disease Management	Dr.C.V.Mohan, Principal Scientist, WorldFish, Malaysia
2	11.01.2021	Virtual Training on Quality fish Feed formulation	Dr. P.C.Mahanta, Dr.P.P.Chakraborti and Dr.N.K.Barik, CIFA, Dr. R.Suresh, WorldFish
3	22.01.2021	Virtual Meeting on Climate Resilient Technologies Study in Assam	Dr.Bimal Kinkar Chand, Dr. R.Suresh, WorldFish
4	27.01.2021	Covid-19 Impact Study in fisheries activities of Assam and Odisha	Dr.Ben Belton,, Dr. Shakuntala Thilsted, Dr. Khalid, Dr.C.V.Mohan WorldFish, Malaysia
5	27.01.2021	Virtual Discussion on Beel Fisheries Development under APART	Dr.D.J. Sharma, Nodal Officer, Dr. Sanjay Sarma, Fishery Coordinator, Dr.R. Suresh, WorldFish
6	12-02-2021	Inception Workshop of the Climate Resilient Technologies Study	Dr.Bimal Chand, Dr. R.Suresh, WorldFish

Annexure 2.

Report on Gender Scoping Study in Selected Districts of Assam

Report on Gender Scoping Study in Selected Districts of Assam



Community Profiles

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DEFINITIONS

Participants in focus group discussions provided the following definitions of terms:

Community Place where people live or stay through the construction of homes and businesses.

Clinics, schools, animals and farming plots are all found within a community.

Family Nuclear and extended; women focus group participants expanded the term slightly to include all those staying within a household. A family was said to require a head who takes care of her or his other family members.

Households Places in which a husband and wife live with their children and extended family members. Households serve as places in which visitors can be received and families can store items.

Village A place where people live in homes and practice agriculture or livestock rearing. A village must have a leader.

INTRODUCTION

The purpose of the community profiles to provide basic descriptions of initial conditions in each community where the APART project works in Assam. This information may contribute to, among other things: 1) evaluating change in gender relations through future studies 2) developing community specific programs or research design 3) strengthening current community engagement processes by providing a better understanding of gender relations, norms and practices that creates social and gender inequalities. These brief profiles are primarily intended to inform the work of APART project only.

The data for this profiles are generated from a gender scoping study conducted by APART project's District Social Sector Coordinators with the support of Technical Experts in Fisheries in a small number of communities purposively selected from a list of sites where the fishery sub-component of the APART project is implementing their intervention. Data from the informants was collected in Assamese, Bengali and Boro language and audio-recorded. These data was translated and transcribed into English by translators and transcribers who are fluent in these languages and In English. The translated and transcribed scripts was checked and validated by an external translator who was not involved in collecting the data. This process ensured that the scripts captured the responses of informants as much as possible. In the event of major differences with transcription and translation, the study lead clarified the differences with the study team.

Community 1: Pub Borola community, Barpeta Cluster, Barpeta District

Key characteristics of the community

Barpeta is one of the district of Assam State and can be reached by bus and train from the capital of its state, Guwahati. Barpeta Road is connected to all over Assam by National Highway No.31, North of the District Head quarter Town of Barpeta. There are regular bus services between Barpeta and Guwahati. The community of Pub Borola is located in Barpeta district. The distance between Pub Borola to Barpeta is approximately 35km and to Guwahati is 115km and the community is accessible by vehicle throughout the year.

The community's primary school, Pub Borola School has provision of class 1 to 8. For further education, there is a high school, secondary school and colleges available in Patshala which is located 8km away from Pub Borola community. As for public healthcare services, there is a sub-centre hospital in community. The nearest civil hospital is located in Patshala. The community also has access to a small vegetable market and sundry shops within its locality. The privately owned sundry shops sells common household items and groceries, food products, farming inputs and clothes. The nearest fish market, named Golobandha is located an approximately 1.5 to 2km away from the community. Community members of Pub Borola access this market to sell and/or trade fish.

Clean and safe drinking water is available throughout the community. Member of the community draw water from their water wells for their daily use. Tube wells however are not available in this community. The community also has a fair cell phone coverage, which is

dependent upon the distance from the provider towers. The community is reported to be free from flood and drought throughout the year.

Primary livelihoods of people who live in the community are agriculture and fisheries. Farmers cultivate paddy in both winter ('Sali') and summer ('Boro') season using summer and winter paddy. Other agricultural products produced by the community members are vegetables, mustard and sugarcane.

There are also farmers raising fish in their paddy field, using paddy-cum-fish culture methods. Others raise fish in their household ponds as an approximately 60% of households in the community has ponds near their houses. Community members also were found to raise livestock and small stocks such as cattle, pigs and chickens. These agricultural, fish and other animal produces are raised for people's own consumption and well as for the market within the community, the Golibandha market or at Pathshala.

Gender relations in the community

This section of report succinctly will summarize the key highlights from the gender scoping study conducted via focus group discussion with a women's group in Pub Borola community.

Gender division of labour in pond polyculture

Table 1: Gender division of labour in community

Roles performed	How long does it take?	Who does this role? And indicate if it is by hired labour		Why do these people do these roles	Risks involved?
		Women	Men		
Pond digging	5 days to 30 days based on nos. of labours/machine been engaged		Men and hired labour	Perception that pond digging requires physical strength that men has. Men's access to and ability to use excavators (JCB) and other equipment.	
Pond cleaning	1 to 2 days		Men and hired labour	Fear of snakes, leaches and insects among women Perception of pond cleaning requires physical strength that men has.	Exposure to snakes, leaches and insects.
Weeding the pond dike	1 to 2 days	Women	Men	Less labour intensive – can be performed by both women and men	No
Liming	Quarterly	Women	Men	Men have the knowledge and skills in the application of lime (quantity) for fish ponds. Women work alongside men in liming.	No
Water filling	1 day using machine		Men	Men have the knowledge and skills to operate the machine.	No
Selection of fingerlings			Men	Men have the knowledge in selecting good quality fingerlings	Fingerlings quality could be

				due to their years of experience and exposure from training programs.	compromised if not carefully selected
Fingerlings purchase			Men	The hatchery where fingerlings are produced is located far from their houses. Only men are able to travel to purchase.	Mortality of fingerlings
Stocking of fingerlings		Women	Men	Women work alongside men in stocking the fingerlings since it can be easily done.	
Feeding/applying fish feed		Women	Men	Women work alongside men in mixing the feed and feeding since women also have the knowledge of how much quantity to feed as well as it can be easily done.	No
Fish harvest for sale	4 to 5 hours		Men	Perception that operating big size net requires physical strength that men has.	
Fish harvest for consumption	2 hour		Men	Perception that operating big size net requires physical strength that men has.	
Selling fish	1 day		Men	Men have the knowledge of the current market price and general information on fish trade. Norms in the community which prevents (ie. derogatory) for women to sell fish in the market.	
Cooking fish	1 to 2 hour	Women		Norms in the community which defines cooking for family as women's role and responsibility.	No

As demonstrated in Table 1 in pond polyculture, men farmers mainly perform pond digging (together with hired labours), pond cleaning, water filling, selection and purchasing of fingerlings, fish harvesting using nets and selling the fish in the market. They also perform tasks which requires them to enter into the water for pond cleaning. These tasks are also performed by hired men labourers.

On the other hand, tasks related to pond polyculture women perform alongside men are weeding the pond dike, liming, stocking of fingerlings and fish feeding. Cooking of fish is an activity performed exclusively by women.

Men predominantly perform tasks which requires specific skills and knowledge gathered through trainings and their social networks, and operation of machines and equipment such as excavators and nets. They also perform tasks which requires them to travel outside of their homestead, such as purchasing inputs and fingerlings, and selling fish in the market. Tasks women perform are predominantly those which are convenient to be conducted within or nearby their houses.

Gender norms

The predominant gender norms identified in the community were regarding division of labor. For women, it is expected that they are responsible towards the household chores and other

care responsibilities. In comparison, men are expected to engage in a productive livelihood activity and generate an income for their family.

Deviations from these roles were few. With regards to **non-typical roles**, there were few instances of men carrying out household tasks. There was only one case where one of the women FGD member reported that her husband enters the kitchen to cook while others indicated that food preparation for the household is the responsibility of the women. One of the member reported that her mother and daughter assists her in performing household responsibilities.

The explanation for these roles were attributed to strong **gender norms** around how women and men should behave. One further stated that women need to adhere to certain cultural rules during their menstruation period which affects the role they play within their household (eg. food preparation) and outside (eg. in tending cattles).

Access to and control over resources and decision making

Women in the FGD group reported that they are able to keep the money earned from farming fish for themselves. Men who are responsible to sell the fish were reported to share the income earned and the rate at which the fish were sold to their wives. These were evidenced by the slip given to them by the traders.

The rates for selling the fish are decided by the men. The reason for men deciding the price and not women is the latter's knowledge of the current market price and general lack of information on fish trade. Women reported to lack information because they do not interact much with the traders (who are predominantly men). Due to these reasons, they fear that they might make wrong decision if they were given the decision making power over the price of fish. The money earned were reported to be saved for their children's education and for future investment for their fish farming.

Perceptions around the benefits and risks in aquaculture

According to all respondents, the main **benefits** reported for **aquaculture** were the income generated from the activities, which they can perform by themselves. These women reported that the income from aquaculture are able to be spent to meet the needs of their family members/household expenses. On the other hand, the main **challenges/risks** were the risk of fish mortality due to disease and contaminated ponds.

Raising and selling fish is reported/perceived as profitable by all the FGD participants. Selling 'puna' (fish seed) was reported them to be more profitable. However, it takes much more labour than fish and the person managing fish seed needs proper training. The risk was reported as also higher in managing and selling fish seed than fish. Among the benefits of farming fish is the profit by performing all the required activities on themselves. The income generated enables the farmers to spend on the need of their family members and household expenses.

Fish farming were further reported to be more profitable than other agricultural livelihood activities (such as paddy farming). The short period of time required for harvesting fish as

compared to other agriculture produce and the profit it brings were reported to be one of the positive outcomes for fish farming

Enabling and constraining factors

All the women farmers reported commitment (“to do the farming wholeheartedly”) to be one of the **enabling factors**. Another participant emphasized that family support is important. She stated that “if my husband brings the necessary items from the market, it’s easier for me to look after the pond”.

Norms regarding women’s ability to access the market were found to be one of the **constraining factors**. Participants of the FGD mentioned that women don’t go to the market. However, women from other caste groups and those who do not have any other constraints are able to do so. One of the participant reported that “there are places in Guwahati (VIP Road) where only SC (caste group) resides, there women goes to the market to sell. But we don’t go. We have lots of household problems. Those who don’t possess anything, from education to any other constraints, they can go”. Another women added that “the men will be ashamed if we go to the market”. Women who do not have husband (ie. unmarried, separated or widowed) were reported to be able to do more fish farming activities (eg. selling the fish in the market) without any constraints.

Community 2: Dhonubhanga Madang/Dhantola, Rangjuli cluster, Goalpara district

Key characteristics of the community

Goalpara is one of the district of Assam State and can be reached by any vehicles from the capital of its state, Guwahati. The community of Dhonubhanga Madang/Dhantola is located in Rangjuli cluster, Goalpara district. The distance between Dhonubhanga Madang/Dhantola to Rangjuli is approximately 9km and to Goalpara is an additional 60km. The district is an approximately 145km from Guwahati. The community is accessible by vehicle throughout the year. The community’s primary school, has the provision of class 1 to 10. For further education, there are secondary school and colleges available in Dhupdhara, which is located 11km away from Rangjuli. As for public healthcare services, there is a sub-centre hospital in community. The nearest civil hospital is located in Rangjuli. The community also has access to a small vegetable market and sundry shops within its locality. The privately owned sundry shops sells common household items and groceries, food products, farming inputs and clothes. The nearest fish markets are located in Rangjuli and Dhupdhara. Community members of Dhonubhanga Madang/Dhantola access this market to sell and/or fish.

Water is available throughout the community. Member of the community draw water from their water wells for their daily use. Tube wells however are not/less available in this community. The community also has a fair cell phone coverage, which is dependent upon the distance from the provider towers. The community is reported to face flood during the rainy season which takes place during summer. However, the community is free from drought. Primary livelihoods of people who live in the community are agriculture and fisheries. Farmers cultivate

paddy in both winter ('Sali') and summer ('Boro') season using summer and winter paddy. Other agricultural products produced by the community members are vegetables, mustard and sugarcane. Mustard cultivation are practices extensively in this community. A small number of farmers raise fish in their paddy field, using paddy-cum-fish culture methods.

An approximately 60% of households in the community raise fish in their household ponds. Community members also were found to raise livestock and smallstock such as cattle, pigs and chickens. These agricultural, fish and other animal produces are raised for people's own consumption and well as for the market within the community, or at markets in Rangjuli and Dhupdhara.

Gender relations in the community

This section of report succinctly will summarize the key highlights from the gender scoping study conducted via focus group discussion with a women's group in Dhonubhanga Madang/Dhantola community.

Gender division of labour in pond polyculture

Table 2: Gender division of labour in community

Roles performed	How long does it take?	Who does this role? And indicate if it is by hired labour		Why do these people do these roles	Risks involved?
		Women	Men		
Pond digging	5 days to 30 days based on nos. of labours/machine been engaged		Men and hired labour	Perception that pond digging requires physical strength that men has. Men's access to and ability to use excavators (JCB) and other equipment.	
Pond cleaning	1 to 2 days		Men and hired labour	Fear of snakes, leaches and insects among women Perception of pond cleaning requires physical strength that men has.	Exposure to snakes, leaches and insects.
Weeding the pond dike	1 to 2 days	Women	Men	Less labour intensive – can be performed by both women and men	No
Liming	Quarterly	Women	Men	Men have the knowledge and skills in the application of lime (quantity) for fish ponds. Women work alongside men in liming.	No
Water filling	1 day using machine		Men	Men have the knowledge and skills to operate the machine.	No
Selection of fingerlings			Men	Men have the knowledge in selecting good quality fingerlings due to their years of experience and exposure from training programs.	Fingerlings quality could be compromised if not carefully selected

Fingerlings purchase			Men	The hatchery where fingerlings are produced is located far from their houses. Only men are able to travel to purchase.	Mortality of fingerlings
Stocking of fingerlings		Women	Men	Women work alongside men in stocking the fingerlings since it can be easily done.	
Feeding/applying fish feed		Women	Men	Women work alongside men in mixing the feed and feeding since women also have the knowledge of how much quantity to feed as well as it can be easily done.	No
Fish harvest for sale	4 to 5 hours		Men	Perception that operating big size net requires physical strength that men has.	
Fish harvest for consumption	2 hour		Men	Perception that operating big size net requires physical strength that men has.	
Selling fish	1 day		Men	Men have the knowledge of the current market price and general information on fish trade. Norms in the community which prevents (ie. derogatory) for women to sell fish in the market.	
Cooking fish	1 to 2 hour	Women		Norms in the community which defines cooking for family as women's role and responsibility.	No

As demonstrated in Table 2 in pond polyculture, men farmers mainly perform pond digging (together with hired labours), pond cleaning, water filling, selection and purchasing of fingerlings, fish harvesting using nets and selling the fish in the market. They also perform tasks which requires them to enter into the water for pond cleaning. These tasks are also performed by hired men labourers.

On the other hand, tasks related to pond polyculture women perform alongside men are weeding the pond dike, liming, stocking of fingerlings and fish feeding. Cooking of fish is an activity performed exclusively by women.

Men predominantly perform tasks which requires specific skills and knowledge gathered through trainings and their social networks, and operation of machines and equipment such as excavators and nets. They also perform tasks which requires them to travel outside of their homestead, such as purchasing inputs and fingerlings, and selling fish in the market. Tasks women perform are predominantly those which are convenient to be conducted within or nearby their houses.

Gender norms

The predominant gender norms identified in the community were regarding division of labor. For women, it is expected that they are responsible towards the household chores and other care responsibilities. In comparison, men are expected to engage in a productive livelihood activity and generate an income for their family.

Deviations from these roles were few. With regards to **non-typical roles**, there were few instances of men carrying out household tasks. There was only one case where one of the women FGD member reported that her husband enters the kitchen to cook while others indicated that food preparation for the household is the responsibility of the women. One of the member reported that her mother and daughter assists her in performing household responsibilities.

The explanation for these roles were attributed to strong **gender norms** around how women and men should behave. One further stated that women need to adhere to certain cultural rules during their menstruation period which affects the role they play within their household (eg. food preparation) and outside (eg. in tending cattles).

Access to and control over resources and decision making

Women in the FGD group reported that they are able to keep the money earned from farming fish for themselves. Men who are responsible to sell the fish were reported to share the income earned and the rate at which the fish were sold to their wives. These were evidenced by the slip given to them by the traders.

The rates for selling the fish are decided by the men. The reason for men deciding the price and not women is the latter's knowledge of the current market price and general lack of information on fish trade. Women reported to lack information because they do not interact much with the traders (who are predominantly men). Due to these reasons, they fear that they might make wrong decision if they were given the decision making power over the price of fish. The money earned were reported to be saved for their children's education and for future investment for their fish farming.

Perceptions around the benefits and risks in aquaculture /beel fisheries

According to all respondents, the main **benefits** reported for **aquaculture** were the income generated from the activities, which they can perform by themselves. These women reported that the income from aquaculture are able to be spent to meet the needs of their family members/household expenses. On the other hand, the main **challenges/risks** were the risk of fish mortality due to disease and contaminated ponds.

Raising and selling fish is reported/perceived as profitable by all the FGD participants. Selling 'puna' (fish seed) was reported them to be more profitable. However, it takes much more labour than fish and the person managing fish seed needs proper training. The risk was reported as also higher in managing and selling fish seed than fish. Among the benefits of farming fish is the profit by performing all the required activities on themselves. The income generated enables the farmers to spend on the need of their family members and household expenses.

Fish farming were further reported to be more profitable than other agricultural livelihood activities (such as paddy farming). The short period of time required for harvesting fish as compared to other agriculture produce and the profit it brings were reported to be one of the positive outcomes for fish farming

Enabling and constraining factors

All the women farmers reported commitment (“to do the farming wholeheartedly”) to be one of the **enabling factors**. Another participant emphasized that family support is important. She stated that “if my husband brings the necessary items from the market, it’s easier for me to look after the pond”.

Norms regarding women’s ability to access the market were found to be one of the **constraining factors**. Participants of the FGD mentioned that women don’t go to the market. However, women from other caste groups and those who do not have any other constraints are able to do so. One of the participant reported that “there are places in Guwahati (VIP Road) where only SC (caste group) resides, there women goes to the market to sell. But we don’t go. We have lots of household problems. Those who don’t possess anything, from education to any other constraints, they can go”. Another women added that “the men will be ashamed if we go to the market”. Women who do not have husband (ie. unmarried, separated or widowed) were reported to be able to do more fish farming activities (eg. selling the fish in the market) without any constraints.

Community 3: Bogibari Community, Dimoria Cluster, Kamrup District

Key characteristics of the community

Kamrup is one of the district of Assam State and can be reached by vehicles from the capital of its state, Guwahati. The community of Bogibari is located in Dimoria cluster, Kamrup district. The distance between Bogibari to Dimoria is approximately 15km. The district is an approximately 36km from Guwahati. The community is accessible by vehicle throughout the year. The community’s primary school, has the provision of class 1 to 10. For further education, there is a secondary school available in Dimoria. As for public healthcare services, there is a sub-centre hospital in community. The nearest civil hospital is located in Sonapur, which is 15km away from Bogibari community. The community also has access to a small vegetable market and sundry shops within its locality. The privately owned sundry shops sells common household items and groceries, food products, farming inputs and clothes.

The nearest fish markets are located an approximately 3-4 km away from the community. Community members of Bogibari access this market to sell and/or fish. Clean and safe drinking water is available throughout the community. Member of the community draw water from their water wells, tube wells and from direct water supplies for their daily use. The community also has a fair cell phone coverage, which is dependent upon the distance from the provider towers. The community is reported not to face any flood or drought. Primary livelihoods of people who live in the community are agriculture and fisheries. There are reported to be more than 300 fishers in the community and most of them have ponds in close proximity of their house. Farmers cultivate paddy in both winter (‘Sali’) and summer (‘Boro’) season using summer and winter paddy. Other agricultural products produced by the community members are vegetables, mustard and sorghum. Community members also were found to raise livestock and smallstock such as cattle, pigs and chickens. These agricultural, fish and other animal produces are raised for people’s own consumption and well as for the market within the community, or at markets in Sonapur and Guwahati.

Gender relations in the community

This section of report succinctly will summarize the key highlights from the gender scoping study conducted via focus group discussion with both women's and men's group in Bogibari Community.

Gender division of labour in pond polyculture

Table 3: Gender division of labour in community

Roles performed	How long does it take?	Who does this role? And indicate if it is by hired labour		Why do these people do these roles	Risks involved?
		Women	Men		
Pond digging	5 days to 30 days based on nos. of labours/machine been engaged		Men and hired labour	Perception that pond digging requires physical strength that men has. Men's access to and ability to use excavators (JCB) and other equipment.	
Pond cleaning	1 to 2 days		Men and hired labour	Fear of snakes, leaches and insects among women Perception of pond cleaning requires physical strength that men has.	Exposure to snakes, leaches and insects.
Weeding the pond dike	1 to 2 days	Women	Men	Less labour intensive – can be performed by both women and men	No
Liming	Quarterly	Women	Men	Men have the knowledge and skills in the application of lime (quantity) for fish ponds. Women work alongside men in liming if the pond is closer to their house.	No
Water filling	By machine 1 day		Men	Men have the knowledge and skills to operate the machine.	No
Selection of fingerlings			Men	Men have the knowledge in selecting good quality fingerlings due to their years of experience	Fingerlings quality could be compromised

				and exposure from training programs.	if not carefully selected
Fingerlings purchase			Men	The hatchery where fingerlings are produced is located far from their houses. Only men are able to travel to purchase.	Mortality of fingerlings.
Stocking of fingerlings		Women	Men	Women work alongside men in stocking the fingerlings since it can be easily done.	
Feeding/applying fish feed		Women	Men	Women work alongside men in mixing the feed and feeding since women also have the knowledge of how much quantity to feed as well as it can be easily done.	No
Fish harvest for sale	3 to 4 hours		Men	Perception that operating big size net requires physical strength that men has.	
Fish harvest for consumption	2 hour		Men	Perception that operating big size net requires physical strength that men has.	
Selling fish	1 day		Men	Men have the knowledge of the current market price and general information on fish trade. Norms in the community which prevents (ie. derogatory) for women to sell fish in the market.	
Cooking fish	1 to 2 hour	Women	Sometimes men	Norms in the community which defines cooking for family as women's role and responsibility. However, men do the work as well if needed.	No

As demonstrated in Table 3 in pond polyculture, men farmers mainly perform pond digging and cleaning (together with hired labours), water filling, selection and purchasing of fingerlings, fish harvesting using nets and selling the fish in the market. They also perform tasks which requires them to enter into the water for pond cleaning. These tasks are also performed by hired men labourers.

On the other hand, tasks related to pond polyculture women perform alongside men are weeding the pond dike, liming, stocking of fingerlings and fish feeding. Cooking of fish is an activity performed exclusively by women.

Men predominantly perform tasks which requires specific skills and knowledge gathered through trainings and their social networks, and operation of machines and equipment such as excavators and nets. They also perform tasks which requires them to travel outside of their homestead, such as purchasing inputs and fingerlings, and selling fish in the market. Tasks women perform are predominantly those which are convenient to be conducted within or nearby their houses.

Gender norms

Although women in the community are predominantly responsible towards their household chores and other care responsibilities, their husbands and children were reported to do the work as well. Men on the other hand are expected to engage in a productive livelihood activity and generate an income for their family. Their productive livelihoods activities such as fish farming were reported to be shared by women and children as well.

Women do not go to the market as they will be seen as bringing dishonour. Women respondents stated that except for the fish selling in the market, they contribute as much as they can in the fish farming activities. The women and men (FGD group) both felt that fish marketing and fish selling should be predominantly done by men only as they have more knowledge of the current market price and general information on fish trade. However, women from a certain caste groups and those who do not have any other (family/societal) constrains for (eg. those who are unmarried, separated and widowed) are able to perform more fish farming activities (eg. sell their fish in the market). Some of the women respondents stated that their household responsibilities are time consuming, hence it prevents them from focusing on fish farming activities.

Deviations from these roles were few. With regards to **non-typical roles**, there were instances of men carrying out household tasks. One of the women in the group reported that her husband and son are able to perform household chores, while another claimed that male members of her family know household work better than her. Women in this group also reported that their husbands share their knowledge on fish farming to their wives and children, enabling all family members to contribute to the activities. Although in this community, the gender norms around household responsibilities and livelihood activities seem to be relatively more relaxed than other communities, particularly within their household, women from certain caste groups, and socio-economic status seems to be more restricted than others.

Access to and control over resources and decision making

Women in the FGD group reported that both women and men have the access to and control over resources. However, these are subject to different types of resources. Women reported to be able to keep the money earned from farming fish and use it for themselves. Men who are responsible to sell the fish were reported to share the income earned and the rate at which the fish were sold. One of the women reported that since men are more engaged in the activity, therefore the men know the accounts/prices at which to trade better. One respondent stated she knows the approximate value of fish traded by her husband but not exact ones.

In case of decision making the women participants reported that both of them have equal say and do discuss things before implementing. The participants also stated their husbands generally listens and have faith in them because they (woman) are the ones who watch over everything when the husband is away from home. All the participants also emphasized that they have a good relationship with their husbands, where it is common to have disagreements but there is discussion and solutions to it. The rates for selling the fish are decided by the male member of the family. The reason for men deciding the price and not women is their lack of knowledge of the current market price and general lack of information on fish trade. The money earned from fish farming were reported to be saved for their children's education and for future investment for their fish farming.

Perceptions around the benefits and risks in aquaculture /beel fisheries

According to all respondents of the study, the main **benefits** reported for **aquaculture** were the income/profit generated from the activities. Women reported that the income from aquaculture are able to be spent to meet the needs of their family members/household expenses. They are also able to consume fresh fish from their own ponds whenever they need. On the other hand, the main **challenges/risks** were the risk of fish mortality due to disease and contaminated ponds. They also reported that people face difficulties during their travel to the market to sell the fish because the roads are not proper.

Raising and selling fish is reported/perceived as profitable by all the participants. Farming and selling fishes such as carps and mola were reported to give them additional income. Although some of the activities in fish farming such as digging the pond, and the cost to purchase fish feeds and medicines is high, the benefits were reported to outweigh the challenges.

Fish farming were further reported to be more profitable than other agricultural livelihood activities (such as Boro paddy farming). One participant noted that fish farming has proven to be the activity which benefitted them the most among all other income earning activities. This is an activity which women can perform on their own. One women mentioned that watching the fishes in her pond during her leisure time gives her joy and happiness. This is one of the unexplored dimensions of fish farming by women which could potentially contribute to outcomes relating to relaxation.

Enabling and constraining factors

Women respondents reported that the main **enabling factor** is family support. If they are given the opportunity to engage in and supported, they are confident that they will be able to perform fish farming activities. One women reported that "if my husband helps in the work that require physical strength like caring heavy sacks of fish feed, clearing weed and also brings the necessary items from the market, then it's easier for me to look after the pond".

On the other hand, main **constraining factors** are norms relating to their mobility and caregiving responsibility. Their mobility restriction to access market and their household responsibilities constrains them from engaging in all activities of aquaculture.

Community 4: Jornagra Community, Chapor Salkocha Cluster, Kokrajhar District

Key characteristics of the community

Kokrajhar is one of the district of Assam State and the district is accessible by vehicles throughout the year. Kokrajhar district is located on the north bank of the river Brahmaputra and is approximately 225km away from Guwahati by road. There are regular bus and train services between Kokrajhar and Guwahati. The community of Jornagra is located in Chapor Salkocha cluster of Kokrajhar district. The distance between Jornagra and Chapor Salkocha is approximately 12km, and from the cluster to Kokrajhar district center is 25km.

The community's primary school, Jornagra School has provision of class 1 to 8. For further education, there is a high school, secondary school and colleges available in Salkocha. As for tertiary education, colleges are available in Kokrajhar district. As for public healthcare services, there is a sub-centre hospital in Salkocha.

The community also has access to a small vegetable market and sundry shops within its locality. The privately owned sundry shops sells common household items and groceries, food products, farming inputs and clothes. The nearest fish markets are located at New Hatipota, which is 8km away from Jornagra, Tilapara, which is 9 km away and Dirghat, which is 10km away from the community. Community members of Jornagra access this market to sell and/or fish.

Clean and safe drinking water is available throughout the community. Member of the community draw water from their water wells and tube wells for their daily use. The community also has a fair cell phone coverage, which is dependent upon the distance from the provider towers. The community is reported to be free from drought throughout the year. However, during summer season (which is the rainy season), there will be flooding. Primary livelihoods of people who live in the community are agriculture and fisheries. Farmers cultivate paddy in both winter ('Sali') and summer ('Boro') season using summer and winter paddy. Other agricultural products produced by the community members are vegetables, mustard and sugarcane.

Aquaculture is one of the most common livelihood activities in the community. Most of the people in the community have ponds within the close proximity to their houses. Women and men in the community are actively involved in fish farming activities. Community members also were found to raise livestock and small stocks such as cattle, pigs and chickens. Piggery is reported to be the most commonly raised livestock in the community. These agricultural, fish and other animal produces are raised for people's own consumption and well as for the market within and outside of their community.

Gender relations in the community

This section of report succinctly will summarize the key highlights from the gender scoping study conducted via focus group discussion with a women's group in Jornagra community.

Gender division of labour in pond polyculture

Table 4: Gender division of labour in community

Roles performed	How long does it take?	Who does this role? And indicate if it is by hired labour		Why do these people do these roles	Risks involved?
		Women	Men		
Constructing boundaries (Boundaries are placed as compared with digging to construct ponds)	It takes 3 to 5 days to create boundaries.		Men and hired labour	Perception by men that the boundaries for the pond can be built by men only.	
Pond cleaning	1 to 2 days	Women	Men and hired labour	In absence of men, women clean the ponds. They go into the water for the cleaning.	Cold and deep water
Weeding the pond dike	1 to 2 days	Women	Men	Less labour intensive – can be performed by both women and men	No
Liming	Quarterly	Women	Men	Both men and women do liming. Male member tend to leave their home for other work, and women are the ones who stay home to look after the ponds.	No
Water filling	1 day using machine		Men	Men have the knowledge and skills to operate the machine.	No
Selection of fingerlings			Men	Men have the knowledge in selecting good quality fingerlings due to their years of experience and exposure from training programs.	Fingerlings quality could be compromised if not carefully selected
Fingerlings purchase			Men	The hatchery where fingerlings are produced is located far from their houses. Only men are able to travel to purchase.	Mortality of fingerlings
Stocking of fingerlings		Women	Men	Women work alongside men in stocking the fingerlings since it can be easily done.	

Feeding/applying fish feed		Women	Men	Women work alongside men in mixing the feed and feeding since women also have the knowledge of how much quantity to feed as well as it can be easily done.	No
Fish harvest for sale	3 to 4 hours	Women	Men	Men predominantly operate the big size net. Women work with them to harvest.	
Fish harvest for consumption	2 hour	Women	Men	Men predominantly operate the big size net. Women work with them to harvest.	
Selling fish	1 day		Men	Men have the knowledge of the current market price and general information on fish trade. Norms in the community which prevents (ie. derogatory) for women to sell fish in the market.	
Cooking fish	1 to 2 hour	Women		Norms in the community which defines cooking for family as women's role and responsibility.	No

As demonstrated in Table 4 in pond polyculture, men farmers mainly perform boundary construction for ponds (together with hired labours), water filling, selection and purchasing of fingerlings and selling the fish in the market. These tasks are also performed by hired men labourers.

On the other hand, tasks related to pond polyculture women perform alongside men are pond cleaning, weeding, liming, stocking of fingerlings, feeding, harvesting for sale and consumption. Cooking of fish is an activity performed exclusively by women.

Men predominantly perform tasks which requires specific skills and knowledge gathered through trainings and their social networks, and operation of machines and equipment such as water filling. They also perform tasks which requires them to travel outside of their homestead, such as purchasing inputs and fingerlings, and selling fish in the market. Tasks women perform are predominantly those which are convenient to be conducted within or nearby their houses.

Gender norms

The predominant gender norms identified in the community were regarding division of labor. For women, it is expected that they are responsible towards the household chores and other care responsibilities. In comparison, men are expected to engage in a productive livelihood activity and generate an income for their family. However, women were found to be engaged

in more activities and lesser restrictions in fish farming compared with women in other communities.

Deviations from these roles were found in the study. With regards to **non-typical roles**, one woman reported to cycle to a nearby market to buy fish feed in the absence of her husband. However, she reported that if there is a need to purchase inputs from a distance market, male members of her house will go.

Access to and control over resources and decision making

In both the women and men FGD groups, men and women were reported to have the access to and control over resources. Women are allowed/able to and use all the profit earned from farming fish because they work and earn for their own house. Men who are responsible to sell the fish were reported to share the income earned and the rate at which the fish were sold. One stated “there is nothing different to access and use between men and women”.

In case of decision making women FGD participants reported that both of them have equal say and do discuss before making any decisions. The participants stated women are the ones who are more actively involved in fish farming compared to men, therefore most decision are taken by women because they take care of the ponds. Women’s group reported also that mostly all the discussion is done with their families for the better fish farming results and to improve their livelihood activities.

Perceptions around the benefits and risks in aquaculture

All the FGD participants reported the **benefits** that they received from their engagement in aquaculture are mainly with regards to the income it provides and fish as a source of food. Compared with agriculture, aquaculture provides more benefit, especially to those who have smaller land area. Aquaculture is able to provide more income/profit even if it’s a small pond compared with agriculture. Apart from the income they receive, fish farmers are able to consume fish throughout the year. According to participants, aquaculture is their only source of livelihood as the income received from selling fishes enables them to buy medicines, fund for their children’s educational needs.

Both the women and men FGD groups stated that they benefit more when women are actively engaged in fish farming and look after the ponds because then the men will be able to go outside and do other work which can contribute to higher income. The income generated enables the farmers to spend on the need of their family members/household expenses.

On the other hand, the main **challenges/risks** were the risk of fish mortality due to disease and contaminated ponds.

Enabling and constraining factors

Respondents stated that **factors enabling** fish farming are personal characteristics such as hard work, dedication and commitment. Even in the absence of male members in their family, they will be able to take up aquaculture. Although women are hardworking, they have less knowledge and skills to perform all the activities in aquaculture as compared with men. However, they can seek the assistance of other men in the community in times of need. One of the respondent reported that there are women in their community who are solely reliant on aquaculture as a source of livelihood.

Joint work between women and men are another **enabling factor** reported by both women and men's group. As men need to leave their house for other work, they need women members of their households to take care of the ponds.

Constraining factors for women are their inability to access market to sell their fishes because these markets are located far from their villages. If the markets are nearby their houses, they would be able to sell fishes. They further mentioned that their husbands almost always go to the market using a bicycle or a motorcycle.

Community 5: Kauhati Community, Dollonghat Cluster, Morigaon District

Key characteristics of the community

Morigaon is one of the districts of Assam State and can be reached by any by any vehicles from the capital of its state, Guwahati. The community of Kauhati is located in Dollonghat cluster, Morigaon district. The distance between Kauhati and Dollonghat is 6km and Morigaon town is located 40km from the community. The district is approximately 100km away from Guwahati. The community of Kauhati is accessible by vehicle throughout the year. The community's private school has a provision of class 1-10. A higher secondary school is also available in the community. For further education, colleges are available in Morigaon town. As for public healthcare services, there is a sub-centre hospital in community. The nearest civil hospital is located in Dollonghat. The community also has access to a small vegetable market and sundry shops within its locality. The privately owned sundry shops sells common household items and groceries, food products, farming inputs and clothes. There is a fish market located in the Kauhati community, where the people go to sell their fishes. Fish farmers also go to Dolloghat market, Morigaon town, Raha town and Nagaon town to sell their fishes.

Gender relations in the community

This section of report succinctly will summarize the key highlights from the gender scoping study conducted via focus group discussion with a women's group in Kauhati community.

Gender division of labour in pond polyculture

Table 5: Gender division of labour in community

Roles performed	How long does it take?	Who does this role? And indicate if it is by hired labour		Why do these people do these roles	Risks involved?
		Women	Men		
Pond digging	5 days to 30 days based on number of labours/machine used		Men and hired labour	Perception that pond digging requires physical strength that men has. Men's access to and ability to use excavators (JCB) and other equipment.	
Pond cleaning	Approx. 1 week based on the size of the pond		Men and hired labour	Fear of snakes, leaches and insects among women Perception of pond cleaning requires physical strength that men has.	Exposure to snakes, leaches and insects.
Weeding the pond dike	1 to 2 days	Women	Men	Less labour intensive – can be performed by both women and men	No
Liming	Monthly	Women	Men	Men have the knowledge and skills in the application of lime (quantity) for fish ponds. Women work alongside men in liming, especially for ponds near their houses.	No
Water filling	1 day using machine		Men	Men have the knowledge and skills to operate the machine.	No
Selection of fingerlings			Men	Men have the knowledge in selecting good quality fingerlings due to their years of experience and exposure from training programs.	Fingerlings quality could be compromised if not carefully selected
Fingerlings purchase			Men	The hatchery where fingerlings are produced is located far from their houses. Only men are able to travel to purchase.	Mortality of fingerlings
Stocking of fingerlings		Women	Men	Women work alongside men in stocking the fingerlings since it can be easily done.	
Feeding/applying fish feed		Women	Men	Women work alongside men in mixing the feed and feeding since women also have the knowledge of how	No

				much quantity to feed as well as it can be easily done.	
Fish harvest for sale	3 to 4 hours		Men	Operating big size net and harvesting requires physical strength and swimming skills. Only men are perceived to have these strength and skills.	
Fish harvest for consumption	2 hour		Men	Operating big size net and harvesting requires physical strength and swimming skills. Only men are perceived to have these strength and skills.	
Selling fish	1 day	Women	Men	Men have the knowledge of the current market price and general information on fish trade. Norms in the community which prevents (ie. derogatory) for women to sell fish in the market.	
Cooking fish	1 to 2 hour	Women		Norms in the community which defines cooking for family as women's role and responsibility.	No

As demonstrated in Table 5 in pond polyculture, men farmers mainly perform pond digging, pond cleaning, water filling, selection and purchasing of fingerlings, fish harvesting using nets and selling the fish in the market. They also perform tasks which requires them to enter into the water for pond cleaning. These tasks are also performed by hired men labourers.

On the other hand, tasks related to pond polyculture women perform alongside men are weeding the pond dike, liming, stocking of fingerlings and fish feeding. Cooking of fish is an activity performed exclusively by women.

Men predominantly perform tasks which requires specific skills and knowledge gathered through trainings and their social networks, and operation of machines and equipment such as excavators and nets. They also perform tasks which requires them to travel outside of their homestead, such as purchasing inputs and fingerlings, and selling fish in the market. Tasks women perform are predominantly those which are convenient to be conducted within or nearby their houses.

Gender norms

The predominant gender **norms** identified in the community were regarding division of labor. For women, it is expected that they are responsible towards the household chores and other care responsibilities. In comparison, men are expected to engage in a productive livelihood activity and generate an income for their family. Apart from the gender division of labor, women are also expected to adhere to restrictions when they are menstruating. They are not allowed to enter into the kitchen and touch the utensils. During this period of time, men are expected to perform household chores, including cooking.

Some of the women respondents reported that they are able to go to the market to sell their fishes and they know other women who are able to do so too. These **non-typical roles** are performed by women who has the support of men. One of the participants reported that she goes to the market to sell fish if the catch from her pond is less. The women has in the past, sold crabs in Ganeshguri market, Guwahati and is familiar with the places in the capital of the state. She said that her husband allows her to travel for this purpose. Another respondent reported that she negotiates with traders whom she knows to sell the fish her family harvest for profit whenever her husband is busy with other activities.

Access to and control over resources and decision making

Women in the FGD group reported that both women and men in their community **have access to and control over resources**. Men who are responsible to sell the fish were reported to share the income earned and the rate at which the fish were sold to their wives. One of the respondent stated that women are better at budgeting and financial management and therefore, men trust them with their income earned suggesting that their husbands give the money earned to their wives.

Decisions in aquaculture activities such as when and where to sell the harvested fishes, buying and stocking fingerlings were found to be made by men. However, these **decisions** were made upon discussion with women. One of the participants stated that despite men having information from others in the market, they value the opinion of women whenever they get consult them prior to making decisions. The income gained from selling their fishes were reported to be saved for their children's education and to further invest in fish farming.

Perceptions around the benefits and risks in aquaculture /beel fisheries

According to the women respondents, the main **benefits** reported for **aquaculture** were the income generated from the activities. Fish farming are more profitable compared with other farming other agricultural produces (eg. paddy) despite the initial cost of investment for pond construction are high. According to the men's groups, integrated fish farming with poultry or piggery can get them more income as women can look after these farms. It will enable them to further strengthen their family's financial status. Nevertheless, the income from aquaculture on its own were reported by the women's group to meet the needs of their family. Apart from the income, aquaculture opens up opportunities for these women to meet people, learn about fish farming and trading (which includes its market price and other information). They are also getting opportunities to receive trainings on farming fish. One of the women stated that she feels good to see her fishes grow and to think of the income it will generate.

On the other hand, the main **challenges** they faced were during the netting/harvesting the fishes. Women reported that they are not able to perform all the activities in fish farming as some of the activities requires physical strength, which is also difficult for men to perform individual, hence they receive assistance from other men. Women also reported that they don't know how to swim and they perceive that going into deep water poses a **risk** for them because of their inability to swim.

Enabling and constraining factors

Women respondents reported that hard work, dedication and their commitment to be one of the **enabling factors** in fish farming. Women participants emphasized that they contribute as much as they can in the fish farming activities. On the other hand, one of the men focus group participant reported that women's engagement (ie. his family members) in his integrated aquaculture and piggery venture, enabled them to earn a high income. He attributes his success to the joint efforts with women in his family.

Factors constraining women respondents to equally engage in aquaculture as men are their access to market. Women are not able to go to the market as the market is located far from their houses. One of the women respondents reported that fishes are taken to be sold at the market at dawn. Therefore, it is challenging for them to leave their houses at that time and travel far to sell their fishes. Another respondent added that they are required to stay home as they are responsible towards their household chores and they do not have the time to travel far. Both the women's and men's FGD groups stated that selling of fish should be predominantly done by men because they have more knowledge of the current market price of fishes and other information pertaining to fish trade.

Women further noted that other constraining factors are their lack of confidence due to their inability to swim and their lack of physical strength. One of the women respondents mentioned that "we can help in every way possible and we do know everything just some things are physically not possible. And the fact that we are getting so much profit through this, it encourages us to work harder and even engage in it individually if possible". Another women emphasized that they are able to farm fish. However, they need motivation as they feel that they are unable to speak properly due to their low educational level. Women who do not have a husband (ie. unmarried, separated or widowed) were reported to be able to do more fish farming activities (ie. selling the fish in the market) without any constrains as compared with married women.

Community 6: Gehua Chalchali, Rupohi Cluster, Nagaon District

Key characteristics of the community

Nagaon is one of the district of Assam State and the district can be reached by any vehicles from the capital of its state, Guwahati. Nagaon road is connected to all over Assam. There are regular bus and train services between Nagaon and Guwahati and to other places in the State.

The community of Gehua Chalchali is located in Nagaon district. The distance between Gehua Chalchali and its cluster, Rupohi is 8km and to Guwahati is approximately 141km. The community is accessible by vehicle throughout the year.

The community's primary school, Gehua Chalchali School has provision of class 1-10. For further education, there is a secondary school in Rupohi. As for public healthcare, there is a sub-center hospital in the community. The nearest civil hospital is located in Rupohi. The community also has access to a small vegetable market and sundry shops within its locality. The privately owned shops sell common household items and groceries, food products, fish farming inputs and clothes. The nearest fish market, named Sulung fish market is located in Rupohi and the next nearest is in Nagaon town. Community members of Gehua Chalchali access this market to sell and/or trade fish.

Clean and safe drinking water is available throughout the community. Members of the community draw water from tube wells. The community also has a fair cell phone coverage, which is dependent upon the distance from the provider towers. The community is reported to be free from flood and drought throughout the year.

Primary livelihoods of people who live in the community are agriculture and fisheries. Farmers cultivate paddy in both winter ('Sali') and summer ('Boro') season using summer and winter paddy. Other agricultural products produced by the community members are vegetables. It is estimated that approximately 75% of the villages are engaged in fisheries. There are also an estimated 55% of farmers raising fish in their paddy field, using paddy-cum-fish culture methods. Community members also were found to raise livestock and small stocks such as cattle, pigs and chickens. These agricultural, fish and other animal products are raised for people's own consumption and well as for the market within the community, in Rupohi or at Nagaon town.

Gender relations in the community

This section of report succinctly will summarize the key highlights from the gender scoping study conducted via focus group discussion with a women's group in Gehua Chalchali community.

Gender division of labour in pond polyculture

Table 6: Gender division of labour in community

Roles performed	How long does it take?	Who does this role? And indicate if it is by hired labour		Why do these people do these roles	Risks involved?
		Women	Men		
Pond digging	5 days to 30 days based on nos. of		Men and hired labour	Perception that pond digging requires physical strength that men has.	

	labours/machine been engaged			Men's access to and ability to use excavators (JCB) and other equipment.	
Pond cleaning	1 to 3 days		Men and hired labour	Women in the community are not allowed to do such work	
Weeding the pond dike	1 to 3 days		Men	Women in the community are only allowed to work in ponds which is within their house surrounding.	
Liming	Quarterly		Men	Men have the knowledge and skills in the application of lime (quantity) for fish ponds.	
Water filling	1 day using machine		Men	Men have the knowledge and skills to operate the machine.	
Selection of fingerlings			Men	Men have the knowledge in selecting good quality fingerlings due to their years of experience and exposure from training programs.	Fingerlings quality could be compromised if not carefully selected
Fingerlings purchase			Men	The hatchery where fingerlings are produced is located far from their houses. Only men are able to travel to purchase.	Mortality of fingerlings
Stocking of fingerlings			Men		
Feeding/applying fish feed		Women	Men	Women work alongside men in mixing the feed and feeding since women also have the knowledge of how much quantity to feed as well as it can be easily done.	
Fish harvest for sale	4 to 5 hours		Men	Perception that operating big size net requires physical strength that men has.	
Fish harvest for consumption	2 hour		Men	Perception that operating big size net requires physical strength that men has.	
Selling fish	1 day		Men	Men have the knowledge of the current market price and general information on fish trade. Norms in the community which prevents (ie. derogatory) for women to sell fish in the market.	
Cooking fish	1 to 2 hour	Women		Norms in the community which defines cooking for family as women's role and responsibility.	

As demonstrated in Table 6 in pond polyculture, men farmers mainly perform pond digging and cleaning (together with hired labours), weeding the dike, liming, water filling, selection, purchasing and stocking of fingerlings, fish harvesting using nets and selling the fish in the market. On the other hand, the task related to pond polyculture women perform alongside men is only fish feeding. Furthermore, cooking of fish is an activity performed exclusively by women.

Men predominantly perform tasks which requires specific skills and knowledge gathered through trainings and their social networks, and operation of machines and equipment such as excavators and nets. They also perform tasks which requires them to travel outside of their homestead, such as purchasing inputs and fingerlings, and selling fish in the market. Tasks women perform are predominantly those which are convenient to be conducted within or very close to their houses. Some of the women dry fish and prepare fish pickles for home consumption.

Gender norms

The predominant gender norms identified in the community were regarding division of labor and mobility. For women, it is expected that they are responsible towards the household chores and other care responsibilities. In comparison, men are expected to engage in a productive livelihood activity and generate an income for their family. Women are further restricted from moving out of their house without the men. If they are performing any livelihood activities, these were conducted only if it is within or around their houses. The explanation for these roles were attributed to strong **gender norms** around expectations of roles and responsibilities of women and men. These norms also explain the restrictions imposed upon women and men from performing non-typical roles. Deviations from these roles were very few. With regards to **non-typical roles**, one women informant reported that her husband took over the responsibility of looking after their children (ie. changing diapers etc.) when she was ill. Apart from this report, none of other women reported men to perform household chores or offered assistance to do so.

There are exceptions to restricted mobility for women. One women informant reported that her daughter is working as a teacher in a nearby school. When asked why her daughter is allowed to move far from her house to work but she herself is not, the women said that the daughter is allowed because she is a bright student since young and that her whole family supported her to become a teacher. Women who do not have husband (ie. unmarried, separated or widowed) were reported to be able to do more fish farming activities without any constrains.

Access to and control over resources and decision making

Women in the FGD group reported that the income earned through raising and selling their harvested fish is managed by men. The reason is because men are the ones who are selling the fishes and hence they make any **decisions** pertaining to the rate at which their fishes are sold as well as the use of income from the sale. Men were reported to have full control over the income generated.

Women informants reported that they don't have much knowledge on fish farming and are not as engaged as the men are. Women have **restricted or lack the access to needed resources** in fish farming. They are not allowed to go outside of their houses, and are not allowed to interact with the traders. Therefore, they lack the knowledge of the current market price and general information on fish trade.

Perceptions around the benefits and risks in aquaculture

According to all respondents, the main **benefits** reported for **aquaculture** were the income generated from the activities, which they can perform by themselves. These women reported that the income from aquaculture are able to be spent to meet the needs of their family members/household expenses. The informants reported to not have any **challenges/risks** in fish farming and that they see only the benefits from this livelihood activity.

Fish farming were reported to be more profitable than other agricultural livelihood activities (such as paddy farming). One of the women informant reported that she and her family used to be engaged more in Boro paddy cultivation. She felt that after adopting the fish culture, they received more profit compared to the Boro paddy cultivation. Another women informant mentioned that paddy cultivation is more energy consuming and also require more hard work compared to fish culture.

Enabling and constraining factors

All the women farmers reported hard work, dedication and their commitment to be the **enabling factors**. One participant stated that family support is important. One of the informant stated that support from family and especially husband is the most important enabling factor for them. Another participant stated an example of one of the women in their village who is doing the tailoring business on her own because she has the support from her husband.

Norms regarding women's restricted mobility and access to ponds, especially those which are located further away from their houses **constrains** their ability to engage in and contribute to equally as men in fish farming. Women informants reported that they are only allowed to work in the pond that is situated within their house boundaries. They are not allowed to go and look after the pond that is situated far away from home. They also don't go to the market for selling the fish.

Community 7: Chengnoi community, Pub-Nalbari cluster, Nalbari district

Key characteristics of the community

Nalbari is one of the district in the state of Assam, India and can be reached using any vehicles from the capital of its state. Nalbari is accessible through National Highway 27 in north and connected to National Highway 427 in South. There are regular bus and train services between Nalbari and Guwahati. The community of Chengnoi is located in Nalbari district. The distance between Chengnoi and its cluster, Pub-Nalbari is 7km and with Nalbari center is 8km. The distance between the community and Guwahati is approximately 79.8km. The community is also accessible by vehicle throughout the year.

The community's primary school has provision of class from 1-10 and a higher secondary school. For further education, there are colleges in the Nalbari town. As for public healthcare

services, there is a sub-centre hospital in community. The nearest civil hospital is located in Nalbari. The community also has access to a small vegetable market and sundry shops within its locality. The privately owned sundry shops sells common household items and groceries, food products, farming inputs and clothes. The nearest fish market is located in Ghograpar, which is approximately 18km away from Chengnoi. Community members of Chengnoi access this market to sell and/or trade fish.

Clean and safe drinking water is available throughout the community. Member of the community draw water from tube wells for their daily use. The community also has a fair cell phone coverage, which is dependent upon the distance from the provider towers. The community is reported to be free from flood and drought throughout the year. The last flood occurred in year 2004.

Primary livelihoods of people who live in the community are agriculture and fisheries. Farmers cultivate paddy in both winter ('Sali') and summer ('Boro') season using summer and winter paddy. Other agricultural products produced by the community members are vegetables, mustard and sugarcane.

People in this community raise fish in their household ponds as an approximately 70% of the people are engaged in fish farming. There are also farmers raising fish in their paddy field, using paddy-cum-fish culture methods, which is practiced by an approximately 30% of the community members. Community members also were found to raise livestock and small stocks such as cattle, pigs and chickens. These agricultural, fish and other animal produces are raised for people's own consumption and well as for the market within the community, in Ghograpar or in Nalbari town.

Gender relations in the community

This section of report succinctly will summarize the key highlights from the gender scoping study conducted via focus group discussion with a women's group in the Chengnoi community.

Gender division of labour in pond polyculture

Table 7: Gender division of labour in community

Roles performed	How long does it take?	Who does this role? And indicate if it is by hired labour		Why do these people do these roles	Risks involved?
		Women	Men		
Pond digging	5 days to 30 days based on nos. of labours/machine been engaged		Men and hired labour	Perception that pond digging requires physical strength that men has. Men's access to and ability to use excavators (JCB) and other equipment.	

Pond cleaning	5 days to 1 week based on the size of the pond		Men and hired labour	Fear of snakes, leaches and insects among women Perception of pond cleaning requires physical strength that men has.	Exposure to snakes, leaches and insects.
Weeding the pond dike	2-3 days	Women	Men	Less labour intensive – can be performed by both women and men	No
Liming	Interval of 2 to 6 month	Women	Men	Men have the knowledge and skills in the application of lime (quantity) for fish ponds. Women work alongside men in liming in ponds nearby their houses	No
Water filling	1 day using machine		Men	Men have the knowledge and skills to operate the machine.	No
Selection of fingerlings			Men	Men have the knowledge in selecting good quality fingerlings due to their years of experience and exposure from training programs.	Fingerlings quality could be compromised if not carefully selected
Fingerlings purchase			Men	The hatchery where fingerlings are produced is located far from their houses. Only men are able to travel to purchase.	Mortality of fingerlings
Stocking of fingerlings		Women	Men	Women work alongside men in stocking the fingerlings since it can be easily done.	
Feeding/applyin g fish feed		Women	Men	Women work alongside men in mixing the feed and feeding since women also have the knowledge of how much quantity to feed as well as it can be easily done.	
Fish harvest for sale	3 to 5 hours		Men	Perception that operating big size net requires physical strength that men has.	
Fish harvest for consumption	2 hour		Men	Perception that operating big size net requires physical strength that men has.	
Selling fish	1 day		Men	Men have the knowledge of the current market price and general information on fish trade. Men traders buys the fishes from the farmers at upon harvesting at their ponds.	
Cooking fish	1 to 2 hour	Women	Men	Norms in the community which defines cooking for family as women's role and responsibility. Men do all the household chores when the women are not able to (ie. when they are ill).	

As demonstrated in Table 7 in pond polyculture, men farmers mainly perform pond digging (together with hired labours), pond cleaning, water filling, selection and purchasing of fingerlings, fish harvesting using nets and selling the fish in the market. They also perform tasks which requires them to enter into the water for pond cleaning. These tasks are also performed by hired men labourers.

On the other hand, tasks related to pond polyculture women perform alongside men are weeding the pond dike, liming, stocking of fingerlings and fish feeding. Cooking of fish is an activity performed predominantly by women. However, when women are not able to, men do cook.

Men predominantly perform tasks which requires specific skills and knowledge gathered through trainings and their social networks, and operation of machines and equipment such as excavators and nets. They also perform tasks which requires them to travel outside of their homestead, such as purchasing inputs and fingerlings, and selling fish in the market. Tasks women perform are predominantly those which are convenient to be conducted within or nearby their houses.

Gender norms

The predominant **gender norms** identified in the community were regarding division of labor. For women, it is expected that they are responsible towards the household chores and other care responsibilities. In comparison, men are expected to engage in a productive livelihood activity and generate an income for their family.

Deviations from these roles were few. With regards to **non-typical roles**, there were few instances of men carrying out household tasks. Men do work on household chores when needed. They were reported to do so especially when the women are not well. One of the participants reported that her brother “can do everything from cleaning to cooking”. She further stated that “today my sister-in-law has come to attend this session, if she reaches late he would do the cooking part”.

Access to and control over resources and decision making

Women in the FGD group reported that both men and women have the **access to and control over resources**. However, men are predominantly responsible in selling the fishes. They were reported to share the income earned and the rate at which the fish were sold to women. In case of making decisions, women participants reported that men take the decisions related to the fish firming on how & when to sell, where to sell, buying and stocking fingerlings. But women mentioned that the men will not concluded or come up with any **decision** without taking or considering the views or suggestions from the women in their household. Participants in the women’s group further reported that they take independent decision on selling of the things they have worked hard for such as eggs, pigs, chickens, and bananas that they cultivate on the dyke.

FGD participants also mentioned that women don't go to market for selling the fishes. They mentioned that there is no any restriction for women who wants to go and sell fish in the market but the situation didn't arise since the traders comes to their pond to buy the fish. One participant mentioned "we don't benefit much if we take the fishes to the market to sell. There is cost of transportation, then Khazana. Since we do not directly sell, we lease out fishes, where we get 80% of the price while sitting at home. If situation arises, maybe we would go, but not now". When the traders come to their pond to buy the fishes, both women and men were reported to be involved in weighing of the fishes and negotiating the price.

Perceptions around the benefits and risks in aquaculture

According to all respondents, the main **benefits** reported for **aquaculture** were the profit it generates for them. FGD participants consider fish farming to be more profitable than any other farming/rearing activity. The income generated enables the farmers to spend on the need of their family members, children's education, household expenses and house renovations. Furthermore, while engaging in fish farming, they can simultaneously engage in many other activities as fish farming does not require much of an attention. Also the short period of time required for harvesting fish as compared to other agriculture produce and the profit it brings were reported to be one of the main positive outcomes for fish farming. On the other hand, the main **challenges/risks** were the risk of theft and their fear of not being able to give medicine for fish disease in time and in the required quantity.

Enabling and constraining factors

All the women farmers reported that **factors enabling** them conducting fish farming are hard work, dedication and their commitment to the fish culture. Being part of FPGs were also reported to be enabling women to engage in fish farming. It was reported that 13 out of 19 FPG members are women. Apart from the membership, these women are able to engage in fish farming because of the support they receive from their family. There are also women SHGs who take pond on lease and perform fish farming. One participant reported that, earlier only men were involved in the fish farming. But after learning and seeing one independent fisherwomen from their community, they also started to get involved and work with their husbands in fish farming. This suggests that having role models/positive deviators encourages/further enables more women to engage in fish farming.

Changes in norms (ie. with regards to restrictions for women to engage in fish farming) were also considered an enabling factor for their increased engagement in the livelihood activity. One participant stated that "my mother does not come out of the house. But you will find me near the pond. Women, particularly daughter-in-laws have now come out to get involved in many [of these] activities". She further described fish farming as an activity which does not require much hard work but one that provides maximum profit. The independent fisherwomen also mentioned that she didn't get criticism from anyone in the village may be because everyone is engaged in some or the other activity.

Annexure 3.

Impacts of COVID-19 on Aquatic Food Supply Chains in Assam



April, 2021

Impacts of COVID-19 on aquatic food supply chains in Assam, India

February – November 2020

Jacqueline Shieh, Suresh Rajendran, Neeta Beypi, Kalpajit Gogoi, Begum Rehana Parvin, Rupan Pegu, Nabamika Sonowal, Saadia Ghazali, Goutam Dhar, Ben Belton, Bianca Haas

Authors

Jacqueline Shieh, Suresh Rajendran, Neeta Beypi, Kalpajit Gogoi, Begum Rehana Parvin, Rupan Pegu, Saadia Ghazali, Goutam Dhar, Ben Belton, Bianca Haas

Authors' Affiliations

¹ WorldFish

Citation

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About FISH

The CGIAR Research Program on Fish Agri-Food Systems (FISH) is a multidisciplinary research program. Designed in collaboration with research partners, beneficiaries and stakeholders, FISH develops and implements research innovations that optimize the individual and joint contributions of aquaculture and small-scale fisheries to reducing poverty, improving food and nutrition security and sustaining the underlying natural resources and ecosystems services upon which both depend. The program is led by WorldFish, a member of the CGIAR Consortium. CGIAR is a global research partnership for a food secure future.

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Contact

WorldFish Communications and Marketing Department, Jalan Batu Maung, Batu Maung, 11960 Bayan Lepas, Penang, Malaysia. Email: fish@cgiar.org

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1. Overview

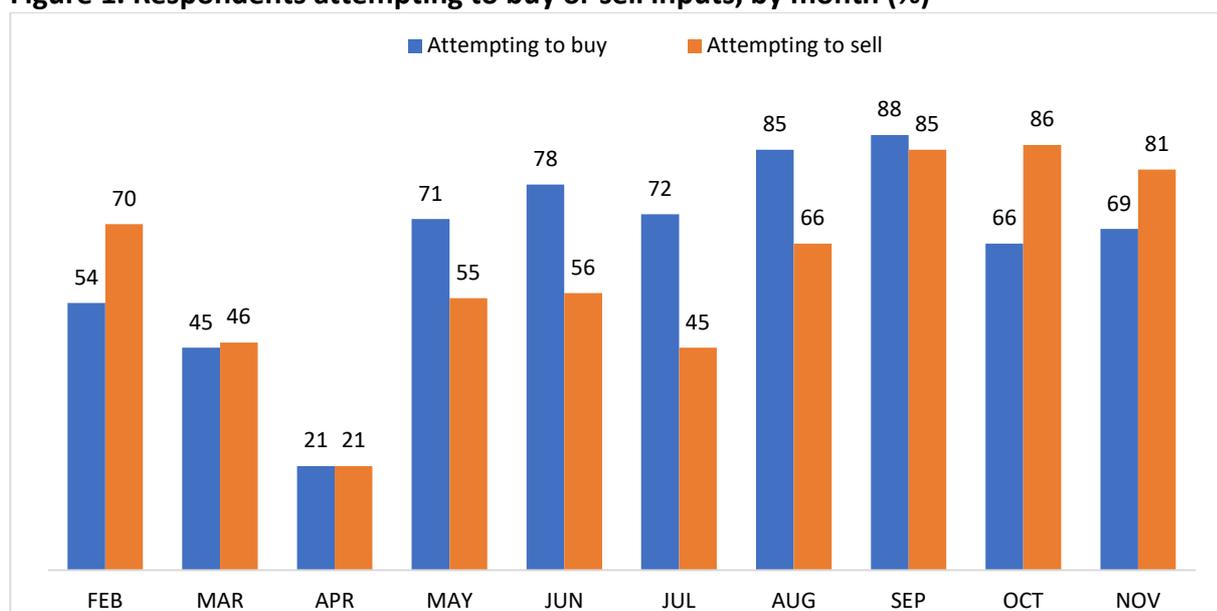
We conducted a monthly phone survey with fish supply chain actors in Assam to assess impacts of COVID-19 on the availability and price of aquatic foods and production inputs. Respondents answered questions about their activity between the months of February and November 2020. The sample totaled 108 respondents, comprised of the following: feed mills (5), feed sellers (14), fish hatcheries (11), fish farmers (26), fishers (25), fish traders (10), processors (5), and retailers (11).

The areas covered included Lower Assam (32%), Upper Assam (29%), Barak Valley (15%), Hills and Central Assam (15%) and North Assam (8%). Districts with the most respondents were Kamrup Rural (9%), Nagaon (8%), Cachar (8%), Jorhat (8%), Morigaon (7%), Nalbari (7%), Lakhimpur (7%), Sonitpur (6%), Majuli (6%), Goalpara (5%) and Guwahati (Kamrup Metro) (5%). A complete overview of survey results can be accessed [here](#).

2. Key Findings

Between February and April 2020, due to COVID-19, there were steep declines in the share of respondents attempting to buy inputs or sell products. The share of respondents trying to buy inputs went down from 54% to 21% between February and April, while the share of businesses attempting to sell products fell even more sharply, from 70% to 21% (Figure 1). The share of respondents attempting to buy inputs recovered in May, jumping to 71%, and remained above this level in June and July. From July onwards, the share of respondents attempting to buy inputs continued to increase, peaking at 88% in September, before falling to 69% in November. The share of businesses attempting to sell products grew more slowly, to around 55% in May and June, before declining slightly to 45% in July, suggesting that demand remained sluggish. However, the share of respondents attempting to sell products climbed from 66% in August to 86% in October, before slightly dropping to 81% in November. In October, the share of businesses attempting to sell products greatly exceeded those attempting to purchase products for the first time since February.

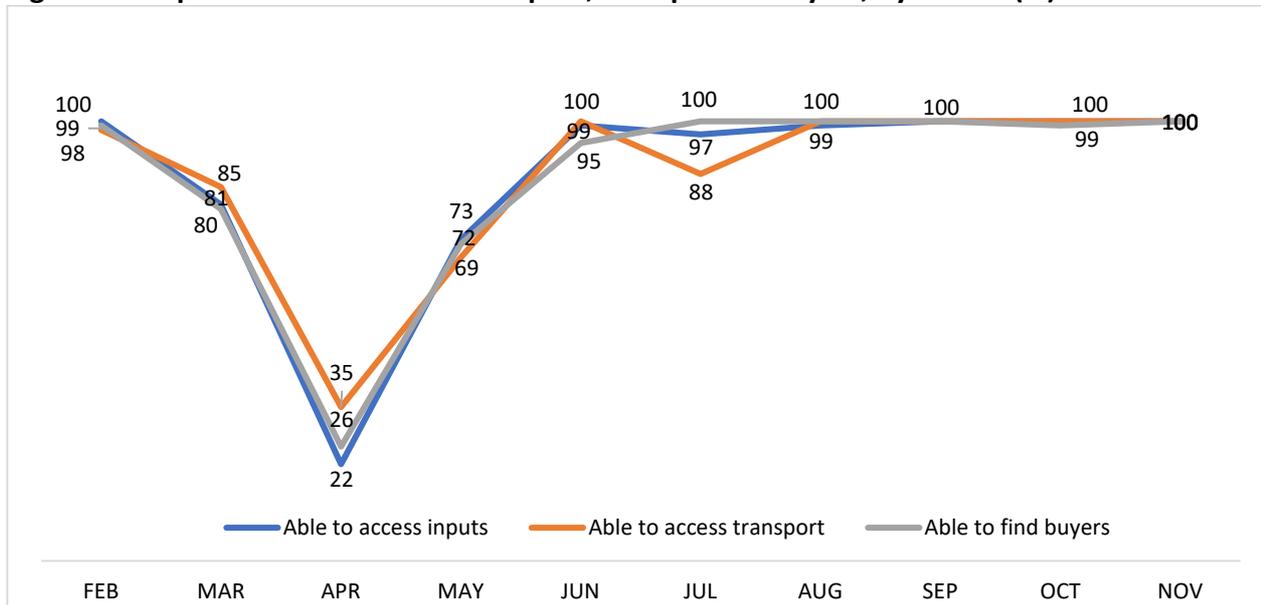
Figure 1. Respondents attempting to buy or sell inputs, by month (%)



Among respondents who attempted to buy or sell products, the share of respondents who were able to access inputs, transport, or buyers followed a similar, but even more pronounced ‘V shaped’

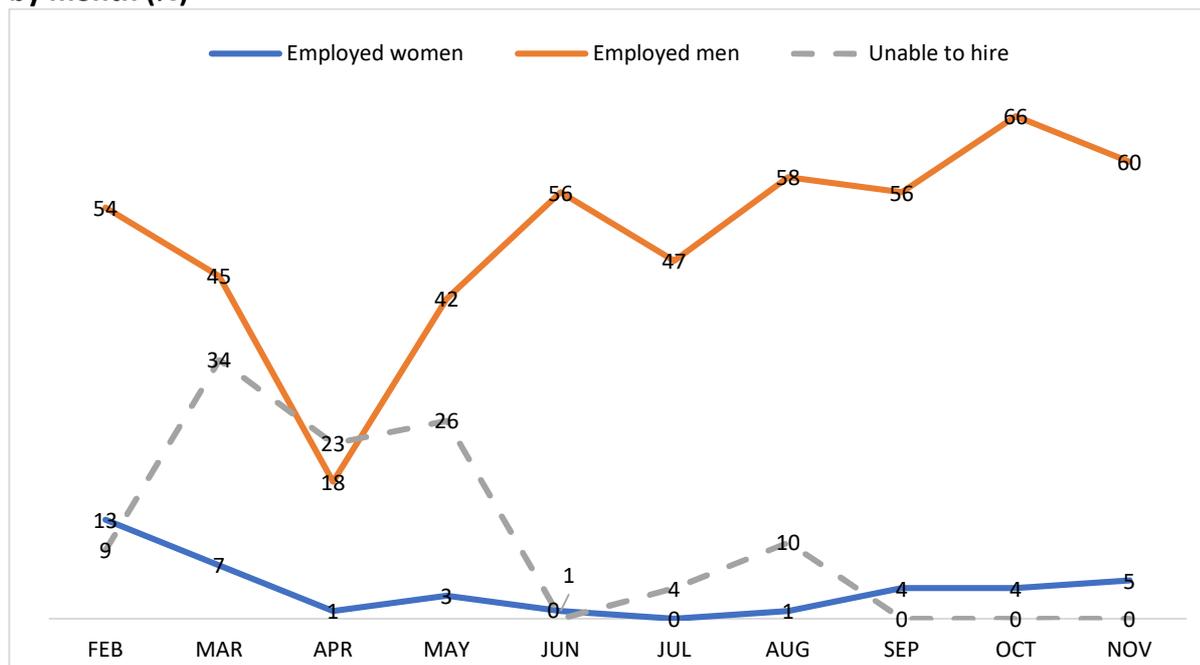
pattern between February and June (Figure 2). The percentage of respondents able to access inputs plunged from 100% in February to 22% in April, but rose again quickly to 98% in June, and remained close to this level from July to November. Respondents' ability to access transport and find buyers followed a similar trend.

Figure 2. Respondents able to access inputs, transport or buyers, by month (%)



Employment also followed a somewhat similar pattern. The percentage of respondents employing male casual workers dropped from 54% in February to 18% in April, rising back to 56% in June before declining again to 47% in July. Between August and November, however, the share of respondents employing men followed a general upward trend. In contrast, the share of respondents employing women daily laborers fell from 13% in February to 1% in April and remained around this level until November, suggesting differential impacts of COVID-19 on women's and men's access to paid work (Figure 3). Between one-quarter and one-third of respondents were unable to hire casual workers during the months of March, April and May, suggesting that movement restrictions impacted both businesses' ability to find workers, and workers' ability to find employment. However, labor access returned to normal in June as well as between September-November, following a slight increase in respondents unable to hire workers in August.

Figure 3. Respondents employing women or men casual workers, or unable to hire casual workers, by month (%)



In May, we began asking respondents whether they had experienced delays in accessing inputs or selling products, or if they had reduced the quantity of inputs used or experienced a reduction in the quantity of products sold, as compared with their usual expectations. 69% and 56% of respondents, respectively, reported that they had experienced delays in accessing inputs or used fewer inputs than usual in May. This number fell to around 6% in June and remained at a similar level through August, suggesting improved input access and availability, consistent with the trends in Figure 1 and 2. A similar pattern was reported by respondents regarding delayed sales and reduced sales volumes, though the share of respondents reporting difficulties increased slightly between June and July from ~5% to ~15%, indicating slowing demand, and remaining at this level until November.

From May onwards, we asked respondents whether they had sufficient income to pay for their family's weekly expenses, and how the quantity of food purchased by the household during the past month compared to usual. Both these indicators improved from May to June and remained unchanged in July. The percentage of respondents with sufficient weekly income grew from 55% to 84% over this period, normalizing to 91% from August to November. 41% of respondents reported purchasing less food than usual in May, suggesting that the COVID-19 crisis negatively affected respondent's food security, but these effects lessened somewhat in June and July, when they were reported by 7% and 1% of respondents, respectively. Between August and November, food purchasing behaviors returned to normal among all respondents.

From May onward, we asked respondents whether they had travelled more than one mile from home during the past month (an indicator of the severity of any movement restrictions). Almost 100% of the respondents travelled more than one mile from their homes, suggesting that their movement was not affected by 'lockdown' measures during these months.

We also asked whether respondents had received any form of assistance and, if so, the source of the assistance, from May onward. 14% of respondents received assistance in May, with government reported as the source in 93% of cases, but only 1-2% received any assistance in June and July, and

none received any assistance from August to November. Fishers accounted for most of the respondents who received assistance. Few farmers and almost no actors in other segments of the value chain reported receiving support during the period.

Hatcheries

Seasonality played a major role in determining the timing of hatchery operations. No hatcheries operated in February and few (9%) opened in March. The number of operational hatcheries increased gradually from 64% in April to 91% in July. Hatcheries that closed between April and June did so for reasons related to COVID-19, including inability to access inputs or transport. Between July and August, all closures were due to hatcheries having adequate stock to sell, perhaps suggesting that demand was low. The number of inoperational hatcheries increased in September until all hatcheries were no longer operating in October and November. The average number of hatchery operating days per month followed a similar temporal trend, rising from zero in February to 16 in July. This may suggest that full production capacity was not reached during these months. However, average business operating days fell back down between July and September to only seven days per month.

In February and March, none of the surveyed hatcheries produced or sold hatchlings. Hatchling production increased sharply from April (when surveyed respondents produced 156 million hatchlings) to May (520 million hatchlings), before falling to 238 million in July. Indian major carps (rohu and mirgal) accounted for the bulk of hatchlings produced by hatcheries in the sample. As no surveyed hatcheries were operating from September to November, no hatchlings were produced or sold.

Feed Mills

Surveyed feed mills went from being fully operational in February and March, to completely inoperational in April. The number of operating mills increased gradually in May (60%) and June (80%), and all were operational again by July (100%). This fell slightly to 80% from August to October, but returned to 100% in November. The average number of days that mills operated by each month followed a similar pattern, dropping from 29 days in February to zero in April, before climbing to 14 days in May and 26 in July. Closures related to COVID-19, were the most common causes for pausing operations in April and May. These reasons included input suppliers being out of stock, reduced rail and road transport preventing movement of inputs, and inability to hire transportation.

Raw material prices increased gradually over the survey period. Between February and March, the average procurement price of raw materials increased from INR 14,927/t to INR 19,407/t (+30%). Procurement prices remained stable in May and November, despite a slight hike in July to INR 22,036/t (a further 14% increase over May prices). The quantity of raw materials procured by mills fell from 259 t in February to zero in April as mills closed, before surging to 448 t in May, following the easing of lockdown measures. Reported procurement fell to zero again in June, before climbing to 220 t the following month. Between September and October, procurement rose from zero to 164 t before falling to 108 in November.

The total amount of feed manufactured fell slightly between February (173 t) and March (155 t), dipping drastically in May (64 t) and plateauing at this level through November. Despite the average feed sales value remaining relatively stable between May and June (INR 25,923/t), the amount of feed sold fell from 52 t to 12 t (-77%) while the total value of feed sold experienced similar declines from INR 1,240,000 to INR 336,000 (-73%). Between June and July, the total amount of feed sold

surged up to 64 t, an 81% increase, maintaining these levels from August to October. However, feed sales fell back down to 50 t in November.

Feed sellers

We surveyed two sets of feed trading businesses; pelleted feed sellers, and non-pelleted feed sellers. Non-pelleted feeds included maize, rice bran and mustard oilcake. Pelleted feed sellers sell floating and sinking feeds.

Almost all non-pelleted feed sellers operated in all months, apart from April when all the operations stopped. Reasons reported for pausing business operations were all related to COVID-19 in some way, and included restrictions on movement by road, out of stock input suppliers, low demand, and inability to hire transport. A similar pattern of business closures and operations was reported by respondents selling pelleted feed, but with 20% remaining shut in March and May.

The procurement price for non-pelleted feed ingredients was fairly consistent throughout the survey period. Although the average procurement price of non-pelleted feed ingredients decreased from INR 23,324/t to INR 20,142/t (-14%) between May and July, prices remained around this level from August onward. From May to November, procurement remained stable at an average of 172 t, except for the months of June (88 t) and October (72 t) when the lowest amounts of ingredients were procured, and July (508t) when the highest amount of feed was also sold (344 t). The lowest amounts of feed sales also occurred in June (44 t) and October (61 t).

The price of non-pelleted feed sold by surveyed mills increased gradually from February to October, likely reflecting rising input prices. The sales value per ton of non-pelleted feed was INR 20,231 in February. Prices steadily rose to INR 26,188/t in October before falling back slightly to INR 24,342 in November (17% higher than in February).

The procurement price for pelleted feed ingredients remained relatively stable between July and September at around INR 55,382/t, falling by 30% in October (INR 38,400/t) before bouncing back in November (INR 50,202/t). Like non-pelleted feed, the highest quantity of feed procured occurred in July (160 t). However, this fell by 54% between July and August (from 160 t to 73 t), dropping even further to 25 t in October, before rising to 60 t in November (62% lower than July). The main non-pelleted feed ingredient procured and sold was mustard oilcake.

The average sales price of pelleted feeds was fairly consistent over the period February-November, although was relatively low in October. The amount of pelleted feed sold climbed from 115 t to 220 t between February and March, but dropped drastically in April to only 65 t. Pelleted feed sales remained around this level from May to September, before experiencing another plunge in October (25 t), when the sales price was at its lowest.

Farmers

Unlike other actors surveyed, all farmers remained operational from February to November. The share of farms procuring inputs dwindled from 35% in February to 15% in April. There was a peak in input purchases in May (reported by 60% of farms), but the share of farmers who reported buying inputs subsequently declined to 24% in June, and then fell further to just 4% from July. Another peak in input purchasing occurred in August (reported by 58% of farms) before falling and rising again from 16% to 32% between September and October.

The main feeds purchased were mustard oilcake, rice bran and sinking feed. Average feed prices remained steady at around INR 23,400/t from February to November, except in May when prices peaked INR 46580/t. May was also the peak month for procuring fish seed, when 40% of farms reported buying. The vast majority of fish seed purchases by surveyed farms were made at this time.

The peak period of fish sales by surveyed farms was in May (17 t) and June (6 t), up from 3 t in February and 1 t in April. Fish sales fell to 3 t in August and remained low through September (1 t) and October (2 t). No fish sales were reported in March or July. Farmgate prices of fish remained stable from February to June at around INR 240/kg, dipping slightly to INR 220/kg in May, when sales were highest. Fish farmgate prices were lowest in August (INR 198/kg), but rose somewhat in September (INR 220/kg) and October (INR 214/kg). Indian or Chinese major carps accounted for all the fish reported as sold during the period.

Fishers

76% of surveyed fishers were operating in February, but none of them went fishing in March and April due to the inability to hire transport (20%), temporary suspension of activities linked to COVID-19 (22%), restrictions on transport preventing movement (22%) and seasonality/fishing ban (19%). Between May and July, no fishers went fishing due to the seasonal fishing ban. As a result, no sales were recorded between March and July, while fishers sold a total 0.69 tons of fish in February.

Fishing resumed in August, when 40% of surveyed fishers were operating, and all fishers resumed activities in October. The total amount of fish landed and sold surged by 88%, from less than a ton in August to 2 t in October, falling slightly to 1.5 t in November. All surveyed fishers reported consuming their own catch, with the average amount of fish consumed by fishers' households increasing from less than 1kg/month to 4 kg/month.

Processors

The activities of fish processors (who are mainly involved in drying fish) are linked closely to those of fishers. Accordingly, nearly all surveyed processors stopped operating in March and April. Reasons for doing so included COVID-19 (13%), raw material prices being too high (25%), the fishing ban (25%), and seasonality (25%). From May to July, all processors stopped operating completely, due the enforcement of the annual fishing ban. A 42% decrease in the quantity of fish processed/sold and a 46% decrease in revenues was reported between February and March.

As fishers began operating again between August and November, most fish processors (80% of respondents) likewise resumed activities during these months. The volume of fish processed steadily rose from 0 t in August to 5 t in November. Although processed fish sales experienced a similar increase from August (0 t) to October (4 t), this fell slightly to 3 t in November. Similarly, processed fish revenues climbed from INR 12,000 to INR 621,400 before dipping somewhat to INR 494,000.

Traders

All fish traders were operating in February and March, but temporarily suspended operations in April for reasons related to COVID-19, including restrictions on road transport and inability to hire transport. By June, 70% of traders were operating again, falling to 30% in July, before all traders were operating again between August and November. The average number of business operating days for traders also remained low from May and July, at around seven days per month (down from

an average of 28 days in February), but returning to 26 days from September to November. The main cause of trading business closures reported in June and July were 'other' unspecified reasons, but likely reflected the impacts of the seasonal fishing ban.

Farmed fish were traded throughout the entire survey period, except in April when all businesses closed. No respondents reported trading marine or freshwater capture fish or shrimp from April to July, but trading of freshwater capture fish resumed from August to November. Farmed fish dominated total sales, accounting for 85% in February (356 t) and nearly all sales in November (450 t). Sales of freshwater capture fish and shrimp stood at around 30 t each in February, with marine capture fish sales amounting to just 1.5 t. While freshwater capture fish trading began again from August to November, sales were much lower than February, with only 2 t being sold in November.

The quantity of fish sold dropped sharply from February to March, irrespective of source. Sales of farmed fish and freshwater capture fish declined by around 43% while shrimp and marine capture fish sales fell by 20% and 25%, respectively. Although trade in farmed fish resumed in May and June, it was at a much lower level than previously (just 6 t in May, and 14 t in June). In November, however, sales bounced back up by 97% to 450 t.

Average prices of farmed fish and freshwater capture fish both declined by around 10% between February and March (from INR 170/kg to INR 148/kg) and (from INR 178/kg to INR 160/kg), respectively. Rohu was hit particularly hard with a 40% decrease (from INR 174/kg to 104/kg). As a result of the drop in sales and prices, traders' gross income from farmed and freshwater fish fell by approximately 50% in March with income from rohu falling by 84%. The average sales price of farmed fish subsequently climbed by approximately 50% in May and June to around INR 223/kg, likely reflecting constrained supply, but in November returned to a similar price as March (INR 156/kg). The sale prices of freshwater capture fish likewise experienced a drastic surge between March and November (from INR 160/kg to INR 475/kg) when trading resumed.

Retailers

The operation of fish retail businesses followed a similar pattern to that of fish traders. All retailers operated in February and March but stopped operating in April. 79% suspended their activity temporarily due to COVID-19, while related transport and movement restrictions accounted for the other closures. Most retailers began operating again in May and June, but only 18% remained operational in July. Reasons for business closures in July related to restrictions on movement, access to transport and closure of suppliers, while about one-third of respondents cited 'other' unspecified reasons. Between August and November, all fish retailers were operating again.

The average number of days in which operational businesses traded followed a similar pattern, falling from 28 days/month in February to zero in April, rising again to 19 days in June and then falling again to 4 days/month in July. From August to November, business operation days returned to February-like levels at 26 days/month.

All operational retailers sold farmed fish in all months from February to July except April. The average price of farmed fish sold remained quite constant at around INR 300/kg from February to July. Details of fish sales were not reported after August, although they are presumed to have continued. Rohu, catla and mrigal contributed most sales of farmed fish in all months. Shrimp and freshwater capture fish were only sold in February and March.

3. Recommendations

- During the COVID-19 pandemic the government has supported uninterrupted transport and inter-state and intra-state movement of critical inputs for fisheries and aquaculture such as fish seed and feed and raw materials, as well as the movement of fish for sale to the markets. However, in practice there were restrictions for transport. Hence there is need to safeguard access to transportation and movement of merchandise.
- Keeping markets open safely is key to safeguarding demand and keeping the supply chain functioning adequately. Though the Government of Assam has taken all steps to support the marketing of fish to meet the demand, consumer access was restricted and there is need to explore other avenues like direct procurement and marketing through hygienic market outlets and online marketing
- As most stakeholders in the fish value chain were affected by the pandemic, there is an urgent need to provide financial support to actors of supply chain who have lost substantial amounts of revenue during these testing times.
- Women's ability to find work in fish supply chains during the survey period has been more severely impacted than men's employment. Further research is needed to understand and address the reasons for this trend.
- Most hatcheries faced difficulties in seed marketing but lacked sufficient space to retain and nurse surplus seed. This means that there may be inadequate quantities of seed available for sale when demand picks up again. Support may be required to help overcome seed shortages and ensure that demand for seed can be met.
- Feed is becoming a major input for aquaculture production and the fish feed supply chain including the raw material supply, feed distribution needs to be strengthened so that shortages do not affect the overall fish production. Establishing more decentralized small-scale feed mills and encouraging production of farm made feeds could help to improve this situation.
- The livelihoods of fishers depending on the inland capture fishery were very severely impacted by the COVID 19 pandemic, followed immediately by the fishing ban, and there is a special need to extend welfare support to these vulnerable communities dependent on capture fisheries.
- Making institutional credit more widely available for stakeholders involved in fisheries and aquaculture could provide vital support during current circumstances, while insurance programmes could help buffer against future shocks.



RESEARCH
PROGRAM ON
Fish

Led by WorldFish

About FISH

The CGIAR Research Program on Fish Agri-Food Systems (FISH) is a multidisciplinary research program. Designed in collaboration with research partners, beneficiaries and stakeholders, FISH develops and implements research innovations that optimize the individual and joint contributions of aquaculture and small-scale fisheries to reducing poverty, improving food and nutrition security and sustaining the underlying natural resources and ecosystems services upon which both depend. The program is led by WorldFish, a member of the CGIAR Consortium. CGIAR is a global research partnership for a food secure future.

For more information, please visit fish.cgiar.org

Annexure 4.

Focus Group Discussion on BMPs for Farmer Producer Groups

Focus Group Discussion with Farmer Producer Groups of APART Fisheries Component on Better Management Practices Guidelines of WorldFish.

Better Management Practices refers to a set of management practices that are developed based on the existing practices and associated risks as determined in consultation with scientists and farmers and relevant industry stakeholders. BMP development process considers the technical, environmental, social and economic issues associated with farming practices and are always location and context specific. BMPs are dynamic and evolving over period and need to be updated periodically. BMP is very much necessary to improve productivity, reduce negative environmental and social consequences of farming. In order to create awareness and adoption of Better Management Practices among the farmers of APART districts, a Farmer Producer Group level Focus Group Discussion was initiated by WorldFish in collaboration with Department of Fisheries, Govt. of Assam and College of Fisheries, Assam Agricultural University. During the discussion all members of the FGP as well as non-beneficiaries were present. Organizing Focus Group Discussion at FPD level is an effective extension strategy to disseminate the information of Better Management Practices among farming community at their place. The list of Focus Group Discussion cum BMP training conducted during the period from October, 2020 to March, 2021 along with their respective reports are given below:

List of Focus Group Discussion cum BMP training conducted:

S l n o	Date	District	Name of the village where the FGD conducted	Name of the FPG attended	Nos. of participants	Male	Female
1	6-10-2020	Golaghat	Biakorua Gaon Golaghat	SK Farmer Producer Group & Paragjyoti Farmer Producer Group	42	27	15
2	07-10-2020	Golaghat	Merapani	Neel FPG	42	33	9
3	08-10-2020	Jorhat	Gendhali	Surojmukhi Matchya Utpadon Got	25	17	8
4	09-10-2020	Jorhat	Horu Sorai	APART Bhogdoi poria Matchya Utpadon got	20	14	6
5	04-12-2020	Goalpara	Kothakuthi	Kothakuthi Udoyaman Matchya Banijya Got	28	17	11

6	29-01-2021	Nalbari	Hahon Bistapur	Nabamilon Meen Utpadon Got and Milon Matchya Utpadon Got	55	36	19
7	04-02-2021	Nalbari	Niz-Bahjani	Atmanirbar FPG & Yubokalyan FPG	25	16	9
8	08-02-2021	Kokrajhar	Jornargra	Nizara FPG	20	11	9
9	09-02-2021	Dhubri	Bilasipara, Futkibari	Pragati Matsya Utpadan	20	12	8
10	10-02-2021	Dhubri	Dhedhepi, Gauripur	Kalorhag FPG & Dhedhepi FPG	30	17	13
11	11-02-2021	Barpeta	Balapara	Arniban FPG	25	16	9
Total					332	216	116

FPG Level Focus Group Discussion on Better Management Practices for Carp Polyculture at Biakorua gaon, Golaghat under APART Fishery sub-Component

In order to creating awareness and adoption of Better Management Practices for carp Polyculture, a FPG level Focus Group Discussion was conducted on 6th October, 2020 at Biakorua gaon, Golaghat by WorldFish in collaboration with College of Fisheries, Assam Agricultural University, Raha and Department of Fisheries, Govt. of Assam. A total of 42 nos of farmers were attended in the Focus Group Discussion which include both beneficiary & non beneficiaries of SK Farmer Producer Group & Paragjyoti Farmer Producer Group, Golaghat under APART. At the very beginning Mr. Pranjal Pratim Gautam, Project Associate, College of Fisheries, AAU, Raha welcomed all the participants and expressed about the program's objectives & its purpose. Miss. Silpika Gogoi, FDO, Golaghat delivered lecture on concept and methods of carp polyculture. She also described about the fish disease, prevention and their control measures in fish cultured pond. Mr. Suman Saikia, TEF, Golaghat delivered lecture on climate resilient short duration fish culture technology and also about the polyculture of carps with other fishes viz. Mola, Jayanti Rahu, Amur Carp etc. Mr. Kalpajit Gogoi, TEF, WorldFish expressed about the Better Management Practices for Carp Polyculture that it is developed by WorldFish experts exclusively for APART and described all the technical aspects of BMP for carp Polyculture one by one in very systematic way along with the participants interaction. He informed the participants that BMP is about how better way we can do our day to day farming activities which will lead to better management of the farm and enable to reduce the loses and increase the benefits as well as sustainability & environmental safety context. Additionally he

also described about the importance of Mola as a good source of nutrition for pregnant & lactating women and more especially for the brain development of fetus & young children and advised to home consumption of Mola rather sale it in market. He also informed about the Carp-Mola Polyculture system that is taken under APART and advised to take the opportunity to adopt as much as possible. He also described about the gender integration in fisheries and role of women in fisheries and aquaculture and advised the women participants to take a significant role in day to day activities in fish farming. In the interaction session the participants were found to be very much interactive and had good interaction with Technical Consultants regarding all technical aspects.



FPG Level Focus Group Discussion on Better Management Practices for Carp Polyculture at Merapani, Golaghat under APART Fishery sub-Component

In order to creating awareness and adoption of Better Management Practices for carp Polyculture, a FPG level Focus Group Discussion was conducted on 7th October, 2020 at Merapani, Golaghat by WorldFish in collaboration with College of Fisheries, Assam Agricultural University, Raha and Department of Fisheries, Govt. of Assam. A total of 20 nos of farmers were attended in the Focus Group Discussion which include both beneficiary & non beneficiaries of Neel Farmer Producer Group, Golaghat under APART. At the very beginning Mr. Pranjal Pratim Gautam, Project Associate, College of Fisheries, AAU, Raha welcomed all the participants and expressed about the program's objectives & its purpose. Miss. Silpika Gogoi, FDO, Golaghat delivered lecture on concept and methods of carp polyculture. She also described about the fish disease, prevention and their control measures in fish cultured pond. Mr. Kalpajit Gogoi, TEF, WorldFish expressed about the Better Management Practices for Carp Polyculture that it is developed by WorldFish experts exclusively for APART and described all the technical aspects of BMP for carp Polyculture one by one in very systematic way along with the participants interaction. He informed the participants that BMP is about how better way we can do our day to day farming activities which will lead to better management of the farm and enable to reduce the loses and increase the benefits as well as sustainability & environmental safety context. Additionally he also described about the importance of Mola as a good source of nutrition for pregnant & lactating women and more especially for the brain development of fetus & young children and advised to home consumption of Mola rather sale it in market. He also informed about the Carp-Mola Polyculture system that is taken under APART and advised to take the opportunity to adopt as much as possible. He also described about the gender integration in fisheries and role of women in fisheries and aquaculture and advised the women participants to take a significant role in day to day activities in fish farming. In the interaction session the participants were found to be very much interactive and had good interaction with Technical Consultants regarding all technical aspects.





FPG Level Focus Group Discussion on Better Management Practices for Carp Polyculture at Horu Sorai, Jorhat under APART Fishery sub-Component

In order to creating awareness and adoption of Better Management Practices for carp Polyculture, a FPG level Focus Group Discussion was conducted on 9th October, 2020 at Horu Sorai, Jorhat by WorldFish in collaboration with College of Fisheries, Assam Agricultural University, Raha and Department of Fisheries, Govt. of Assam. A total of 20 nos of farmers were attended in the Focus Group Discussion which include both beneficiary & non beneficiaries of APART Bhogdoi poria Matchya Utpadon Got, Jorhat under APART. At the very beginning Mr. Pranjal Pratim Gautam, Project Associate, College of Fisheries, AAU, Raha welcomed all the participants and expressed about the program's objectives & its purpose. Mr. Dhanjit Das, FD, Jorhat delivered lecture on concept and methods of carp polyculture. He also described about the fish disease, prevention and their control measures in fish cultured pond. Mr. Suman Saikia, TEF, Jorhat delivered lecture on climate resilient short duration fish culture technology and also about the polyculture of carps with other fishes viz. Mola, Jayanti Rahu, Amur Carp etc. Mr. Kalpajit Gogoi, TEF, WorldFish expressed about the Better Management Practices for Carp Polyculture that it is developed by WorldFish experts exclusively for APART and described all the technical aspects of BMP for carp Polyculture one by one in very systematic way along with the participants interaction. He informed the participants that BMP is about how better way we can do our day to day farming activities which will lead to better management of the farm and

enable to reduce the losses and increase the benefits as well as sustainability & environmental safety context. Additionally he also described about the importance of Mola as a good source of nutrition for pregnant & lactating women and more especially for the brain development of fetus & young children and advised to home consumption of Mola rather sale it in market. He also informed about the Carp-Mola Polyculture system that is taken under APART and advised to take the opportunity to adopt as much as possible. He also described about the gender integration in fisheries and role of women in fisheries and aquaculture and advised the women participants to take a significant role in day to day activities in fish farming. In the interaction session the participants were found to be very much interactive and had good interaction with Technical Consultants regarding all technical aspects.



FPG Level Focus Group Discussion on Better Management Practices for Carp Polyculture at Kothakuthi, Goalpara under APART Fishery sub-Component

In order to creating awareness and adoption of Better Management Practices for carp Polyculture, a FPG level Focus Group Discussion was conducted on 4th December, 2020 at Kothakuthi, Goalpara by WorldFish in collaboration with College of Fisheries, Assam Agricultural University, Raha and Department of Fisheries, Govt. of Assam. A total of 28 nos of farmers were attended in the Focus Group Discussion which include both beneficiary & non beneficiaries of Kothakuthi Udayaman Matchya Banijya Got, Kothakuthi under APART. At the very beginning Mr. Pranjal Pratim Gautam, Project Associate, College of Fisheries, AAU, Raha welcomed all the participants and expressed about the program's objectives & its purpose. Mr. Ibrahim Khan, FDO, Goalpara delivered lecture on concept and methods of carp polyculture. He also described about the fish disease, prevention and their control measures in fish cultured pond. Mr. Bubul Sainary, TEF, Goalpara delivered lecture on climate resilient short duration fish culture technology and also about the polyculture of carps with other fishes viz. Mola, Jayanti Rahu, Amur Carp etc. Mr. Kalpajit Gogoi, TEF, WorldFish expressed about the Better Management Practices for Carp Polyculture that it is developed by WorldFish experts exclusively for APART and described all the technical aspects of BMP for carp Polyculture one by one in very systematic way along with the participants interaction. He informed the participants that BMP is about how better way we can do our day to day farming activities which

will lead to better management of the farm and enable to reduce the loses and increase the benefits as well as sustainability & environmental safety context. Additionally he also described about the importance of Mola as a good source of nutrition for pregnant & lactating women and more especially for the brain development of fetus & young children and advised to home consumption of Mola rather sale it in market. He also informed about the Carp-Mola Polyculture system that is taken under APART and advised to take the opportunity to adopt as much as possible. He also described about the gender integration in fisheries and role of women in fisheries and aquaculture and advised the women participants to take a significant role in day to day activities in fish farming. In the interaction session the participants were found to be very much interactive and had good interaction with Technical Consultants regarding all technical aspects.



FPG Level Focus Group Discussion on Better Management Practices for Carp Polyculture at Hahon Bistupur, Nalbari under APART Fishery sub-Component

In order to creating awareness and adoption of Better Management Practices for carp Polyculture, a FPG level Focus Group Discussion was conducted on 29th January, 2021 at Hahon Bistupur, Nalbari by WorldFish in collaboration with College of Fisheries, Assam Agricultural University, Raha and Department of Fisheries, Govt. of Assam. A total of 55 nos of farmers were attended in the Focus Group Discussion which include both beneficiary & non beneficiaries of Nabamilon Meen Utpadon Got and Milon Matchya Utpadon Got under APART. At the very beginning Mr. Biswajit Borah, Project Associate, College of Fisheries, AAU, Raha welcomed all the participants and expressed about the program's objectives & its purpose. Mr. Talukya Haloi, DFDO, Nalbari delivered lecture on concept and methods of carp polyculture. Mr. Ibrahim Khan, FDO, Nalbari described about the fish disease, prevention and their control measures in fish cultured pond. Mr. Gunajit Talukdar, TEF, Nalbari delivered lecture on climate resilient short duration fish culture technology and also about the polyculture of carps with other fishes viz. Mola, Jayanti Rahu, Amur Carp etc. Mr. Biswajit Borah, Project Associate, College of Fisheries, AAU, Raha informed about the supplementary fish feed and methods of feed preparation. Mr. Kalpajit Gogoi, TEF, WorldFish expressed about the Better Management Practices for Carp Polyculture that it is developed by WorldFish experts exclusively for APART and described all the technical aspects of BMP for carp Polyculture one by one in very systematic way along with the participants interaction. He informed the participants that BMP is about how better way we can do our day to day farming activities which will lead to better management of the farm and enable to reduce the loses and increase the benefits as well as sustainability & environmental safety context. Additionally he also described about the importance of Mola as a good source of nutrition for pregnant & lactating women and more especially for the brain development of fetus & young children and advised to home consumption of Mola rather sale it in market. He also informed about the Carp-Mola Polyculture system that is taken under APART and advised to take the opportunity to adopt as much as possible. He also described about the gender integration in fisheries and role of women in fisheries and aquaculture and advised the women participants to take a significant role in day to day activities in fish farming. In the interaction session the participants were found to be very much interactive and had good interaction with Technical Consultants regarding all technical aspects.



FPG Level Focus Group Discussion on Better Management Practices for Carp Polyculture at Niz- Bahjani, Nalbari under APART Fishery sub-Component

In order to creating awareness and adoption of Better Management Practices for carp Polyculture, a FPG level Focus Group Discussion was conducted on 4th February, 2021 at Niz-Bahjani, Nalbari by WorldFish in collaboration with College of Fisheries, Assam Agricultural University, Raha and Department of Fisheries, Govt. of Assam. A total of 25 nos of farmers were attended in the Focus Group Discussion which include both beneficiary & non beneficiaries of Atmanirbhor Farmer Producer Group and Yubokalyan Farmer Producer Group under APART. At the very beginning Mr. Biswajit Borah, Project Associate, College of Fisheries, AAU, Raha welcomed all the participants and expressed about the program's objectives & its purpose. He also delivered lecture on concept and methods of carp polyculture. He also described about the fish disease, prevention and their control measures in fish cultured pond. Mr. Gunajit Talukdar, TEF, Nalbari delivered lecture on climate resilient short duration fish culture technology and also about the polyculture of carps with other fishes viz. Mola, Jayanti Rahu, Amur Carp etc. Mr. Biswajit Bora, Project Associate, College of Fisheries, AAU, Raha informed about the supplementary fish feed and methods of feed preparation. Mr. Kalpajit Gogoi, TEF, WorldFish expressed about the Better Management Practices for Carp Polyculture that it is developed by WorldFish experts exclusively for APART and described all the technical aspects of BMP for carp Polyculture one by one in very systematic way along with the participants interaction. He

informed the participants that BMP is about how better way we can do our day to day farming activities which will lead to better management of the farm and enable to reduce the losses and increase the benefits as well as sustainability & environmental safety context. Additionally he also described about the importance of Mola as a good source of nutrition for pregnant & lactating women and more especially for the brain development of fetus & young children and advised to home consumption of Mola rather sale it in market. He also informed about the Carp-Mola Polyculture system that is taken under APART and advised to take the opportunity to adopt as much as possible. He also described about the gender integration in fisheries and role of women in fisheries and aquaculture and advised the women participants to take a significant role in day to day activities in fish farming. In the interaction session the participants were found to be very much interactive and had good interaction with Technical Consultants regarding all technical aspects.



FPG Level Focus Group Discussion on Better Management Practices for Carp Polyculture at Jornargra, Kokrajhar under APART Fishery sub-Component

In order to creating awareness and adoption of Better Management Practices for carp Polyculture, a FPG level Focus Group Discussion was conducted on 8th February, 2021 at Jornargra, Kokrajhar by WorldFish in collaboration with College of Fisheries, Assam Agricultural University, Raha and Department of Fisheries, Govt. of Assam. A total of 20 nos of

farmers were attended in the Focus Group Discussion which include both beneficiary & non beneficiaries of Nizara Farmer Producer Group under APART. At the very beginning Mr. Pranjal Pratim Gautam, Project Associate, College of Fisheries, AAU, Raha welcomed all the participants and expressed about the program's objectives & its purpose. Mr. Gobinda Basumatary, FDO, Kokrajhar delivered lecture on concept and methods of carp polyculture. He also described about the fish disease, prevention and their control measures in fish cultured pond. Mr. Dipankar Pathok, TEF, Nalbari delivered lecture on climate resilient short duration fish culture technology and also about the polyculture of carps with other fishes viz. Mola, Jayanti Rahu, Amur Carp etc. Mr. Biswajit Bora, Project Associate, College of Fisheries, AAU, Raha informed about the supplementary fish feed and methods of feed preparation. Mr. Kalpajit Gogoi, TEF, WorldFish expressed about the Better Management Practices for Carp Polyculture that it is developed by WorldFish experts exclusively for APART and described all the technical aspects of BMP for carp Polyculture one by one in very systematic way along with the participants interaction. He informed the participants that BMP is about how better way we can do our day to day farming activities which will lead to better management of the farm and enable to reduce the loses and increase the benefits as well as sustainability & environmental safety context. Additionally he also described about the importance of Mola as a good source of nutrition for pregnant & lactating women and more especially for the brain development of fetus & young children and advised to home consumption of Mola rather sale it in market. He also informed about the Carp-Mola Polyculture system that is taken under APART and advised to take the opportunity to adopt as much as possible. He also described about the gender integration in fisheries and role of women in fisheries and aquaculture and advised the women participants to take a significant role in day to day activities in fish farming. In the interaction session the participants were found to be very much interactive and had good interaction with Technical Consultants regarding all technical aspects.





FPG Level Focus Group Discussion on Better Management Practices for Carp Polyculture at Futkibari, Bilashipara, Dhubri under APART Fishery sub-Component

In order to creating awareness and adoption of Better Management Practices for carp Polyculture, a FPG level Focus Group Discussion was conducted on 9th February, 2021 at Futkibari, Bilashipara, Dhubri by WorldFish in collaboration with College of Fisheries, Assam Agricultural University, Raha and Department of Fisheries, Govt. of Assam. A total of 20 nos of farmers were attended in the Focus Group Discussion which include both beneficiary & non beneficiaries of Pragati Matchya Utpadon Got under APART. At the very beginning Mr. Pranjal Pratim Gautam, Project Associate, College of Fisheries, AAU, Raha welcomed all the participants and expressed about the program's objectives & its purpose. Mr. Julfikar Ali, FDO, Dhubri delivered lecture on concept and methods of carp polyculture. He also described about the fish disease, prevention and their control measures in fish cultured pond. Mr. Biswajit Bora, Project Associate, College of Fisheries, AAU, Raha delivered lecture on climate resilient short duration fish culture technology and also about the polyculture of carps with other fishes viz. Mola, Jayanti Rahu, Amur Carp etc. Mr. Utpal Chakrawati, ECF, Dhubri informed about the general precaution while constructing a pond for fish farming. Mr. Kalpajit Gogoi, TEF, WorldFish expressed about the Better Management Practices for Carp Polyculture that it is developed by WorldFish experts exclusively for APART and described all the technical aspects of BMP for carp Polyculture one by one in very systematic way along with the participants interaction. He informed the participants that BMP is about how better way we can do our day to day farming activities which will lead to better management of the farm and enable to reduce the loses and increase the benefits as well as sustainability & environmental safety context. Additionally he also described about the importance of Mola as a good source of nutrition for pregnant & lactating women and more especially for the brain development of fetus & young children and advised to home consumption of Mola rather sale it in market. He also informed about the Carp-Mola Polyculture system that is taken under APART and advised to take the opportunity to adopt as much as possible. He also described about the gender integration in fisheries and role of women in fisheries and aquaculture and advised the women participants to

take a significant role in day to day activities in fish farming. In the interaction session the participants were found to be very much interactive and had good interaction with Technical Consultants regarding all technical aspects.



FPG Level Focus Group Discussion on Better Management Practices for Carp Polyculture at Dhedhepi, Gauripur, Dhubri under APART Fishery sub-Component

In order to creating awareness and adoption of Better Management Practices for carp Polyculture, a FPG level Focus Group Discussion was conducted on 10th February, 2021 at Dhedhepi, Gauripur, Dhubri by WorldFish in collaboration with College of Fisheries, Assam Agricultural University, Raha and Department of Fisheries, Govt. of Assam. A total of 30 nos of farmers were attended in the Focus Group Discussion which include both beneficiary & non beneficiaries of Kalorhag Farmer Producer Group and Dhedhepi Farmer Producer Group under APART. At the very beginning Mr. Pranjal Pratim Gautam, Project Associate, College of Fisheries, AAU, Raha welcomed all the participants and expressed about the program's objectives & its purpose. He also delivered lecture on concept and methods of carp polyculture. Mr. Anisur Rahman, FDO, Dhubri described about the fish disease, prevention and their control measures in fish cultured pond. He also informed about the supplementary fish feed and methods of feed preparation. Mr. Biswajit Bora, Project Associate, College of Fisheries, AAU, Raha delivered lecture on climate resilient short duration fish culture technology and also about the

polyculture of carps with other fishes viz. Mola, Jayanti Rahu, Amur Carp etc. Mr. Kalpajit Gogoi, TEF, WorldFish expressed about the Better Management Practices for Carp Polyculture that it is developed by WorldFish experts exclusively for APART and described all the technical aspects of BMP for carp Polyculture one by one in very systematic way along with the participants interaction. He informed the participants that BMP is about how better way we can do our day to day farming activities which will lead to better management of the farm and enable to reduce the loses and increase the benefits as well as sustainability & environmental safety context. Additionally he also described about the importance of Mola as a good source of nutrition for pregnant & lactating women and more especially for the brain development of fetus & young children and advised to home consumption of Mola rather sale it in market. He also informed about the Carp-Mola Polyculture system that is taken under APART and advised to take the opportunity to adopt as much as possible. He also described about the gender integration in fisheries and role of women in fisheries and aquaculture and advised the women participants to take a significant role in day to day activities in fish farming. In the interaction session the participants were found to be very much interactive and had good interaction with Technical Consultants regarding all technical aspects.



FPG Level Focus Group Discussion on Better Management Practices for Carp Polyculture at Balapara, Barpeta under APART Fishery sub-Component

In order to creating awareness and adoption of Better Management Practices for carp Polyculture, a FPG level Focus Group Discussion was conducted on 11th February, 2021 at Balapara by WorldFish in collaboration with College of Fisheries, Assam Agricultural University, Raha and Department of Fisheries, Govt. of Assam. A total of 25 nos of farmers were attended in the Focus Group Discussion which include both beneficiary & non beneficiaries of Anirban Farmer Producer Group under APART. At the very beginning Mr. Pranjal Pratim Gautam, Project Associate, College of Fisheries, AAU, Raha welcomed all the participants and expressed about the program's objectives & its purpose. Mr. Bharat Sarma, DFDO, Barpeta delivered lecture on concept and methods of carp polyculture. Mr. Sanayama Singha, TEF, Barpeta described about the fish disease, prevention and their control measures in fish cultured pond. He also informed about the supplementary fish feed and methods of feed preparation. Mr. Biswajit Bora, Project Associate, College of Fisheries, AAU, Raha delivered lecture on climate resilient short duration fish culture technology and also about the polyculture of carps with other fishes viz. Mola, Jayanti Rahu, Amur Carp etc. Mr. Kalpajit Gogoi, TEF, WorldFish expressed about the Better Management Practices for Carp Polyculture that it is developed by WorldFish experts exclusively for APART and described all the technical aspects of BMP for carp Polyculture one by one in very systematic way along with the participants interaction. He informed the participants that BMP is about how better way we can do our day to day farming activities which will lead to better management of the farm and enable to reduce the loses and increase the benefits as well as sustainability & environmental safety context. Additionally he also described about the importance of Mola as a good source of nutrition for pregnant & lactating women and more especially for the brain development of fetus & young children and advised to home consumption of Mola rather sale it in market. He also informed about the Carp-Mola Polyculture system that is taken under APART and advised to take the opportunity to adopt as much as possible. He also described about the gender integration in fisheries and role of women in fisheries and aquaculture and advised the women participants to take a significant role in day to day activities in fish farming. In the interaction session the participants were found to be very much interactive and had good interaction with Technical Consultants regarding all technical aspects.



Annexure 5.

Draft BMP for Carp Polyculture with Genetically Improved Fish Strains

Assam Agribusiness and Rural Transformation Project

Fishery Sub-Component



Better Management Practices for Carp Polyculture with Genetically Improved Fish Strain



Better Management Practices for Carp Polyculture with Genetically Improved Fish Strain

Aquaculture is predicted to play a major and ever increasing role in meeting human needs for protein. Aquaculture systems in Assam are characterized by polyculture of Indian major carps and exotic carps and largely based on the use of unimproved species and strains. As knowledge and experience are accumulated in relation to the management, feeding and animal health issues of such production systems, the availability of genetically more productive stock becomes imperative in order to more effectively use resources and improve the production.

Genetically improved strain has high growth efficiency developed through selective breeding. As a result, demand in the market for genetically improved strain is increasing and therefore the fish farmer has a great incentive to cultivate “Jayanti Rohu” and “Amur Carp”. Morphologically “Jayanti rohu” is similar to normal Rohu but the growth rate is 13 % - 17 % higher than that of ordinary Rohu, less susceptible to diseases and attractive look (slightly reddish in colour). The improved rohu proved to be feed neutral and effective under all culture practices which have enhanced the acceptance level. In the similar way, “Amur Carp” compared to the common carp is fast growing (about 27 % faster than the existing stock), late maturing (first spawning at the end of first year), accepts artificial feed and has similar food habit to that of existing stock, less susceptible for diseases, body is slender and belly is smaller than existing stock. Addition of such genetically improved fish strains in polyculture system can provide additional production and profit with effective use of resources. It is in this context, scientifically validated better management practices (BMPs) covering the full life cycle of the farming operation is essential. APART project is committed to supporting sustainable intensification of polyculture of carps with genetically improved fish strains and plans to achieve a substantial income from carp polyculture system.

Promoting the implementation of BMPs across the value chain for carp polyculture with genetically improved fish strains could benefit the state through improved productivity, more effective use of resources, reduced negative environmental and social consequences. Such BMPs and technical guidelines should cover areas of general husbandry, pond preparation, water quality, feed management, disease management, record keeping, harvest and post-harvest handling. This draft version of BMP for carp polyculture with genetically improved fish strains is complementary to the Package of Practice (PoP) developed by College of Fisheries, AAU, Assam under the APART project. BMP provided by WorldFish will be an evolving document and will be updated considering the results and experiences of Year 1 of carp polyculture with genetically improved fish strains demonstration under the ongoing APART project.

The purpose of BMP guidelines is to increase awareness and build capacity of carp farmers, extension service providers, and other value chain actors on better management practices for carp polyculture with genetically improved fish strains in Assam.

BMP recommendations:

1. Pond Preparation

- 1.1. Drain pond; remove sludge from the bottom and let it dry
- 1.2. Keep pond dyke clean from bushes to prevent hiding of predators
- 1.3. Repair dyke as necessary to control water seepage
- 1.4. Repair inlet and outlet pipes
- 1.5. Place bamboo or other substrates – which help in colonizing periphyton and also help in protecting from poaching of fish
- 1.6. Apply lime, distributing evenly over the pond surface, at a recommended rate
- 1.7. Consider fencing the sides of pond using nylon net/bamboo/any other locally available materials or bio-fencing using plants like Assam Lemon, Chitranalla

Key considerations:

- Drain annually OR once in two years – depending on the need
- Liming is must if soil pH in the pond is <6.5
- Consider using cost-effective materials for fencing or provide bio-fencing

2. Water Filling and fertilization of pond

- 2.1. Fill pond; maintain water depth between 1.5-2.0 m. Filter water with double lined nylon nets if water from natural sources is used for filling.
- 2.2. Fertilize pond, using chemical fertilizers @28 kg N and 21 kg P/ha with Urea and single super phosphate OR other fertilizers readily available in local market.
- 2.3. Consider applying recommended doses of organic manure (livestock manure/chicken manure/compost) in heaps in one or two pond corners enclosed with the help of split bamboo. Consider application of bio-fertilizers like Anabaena – Azolla complex

Key considerations:

- Install a water level measuring pole marked at 1m,1.5m and 2 m to check water level
- Monitor plankton growth using Secchi disc(maintain adequate greenness i.e., around 30 cm Secchi disc visibility) and adjust subsequent fertilization rate (clear water= low in natural food; too green= high plankton density)

3. Stocking

- 3.1. Pond is ready to stock once water turns green (rich in plankton – natural food for fish)
- 3.2. Acquire fish seed from Department hatcheries, Multiplication centres or Registered Private hatcheries (improved Jayanti Rohu and Amur carp)
- 3.3. Replace the normal Rohu and Common Carp fish seeds with Jayanti Rohu and Amur Carp fish seed.
- 3.4. Treat the Jaynti Rohu and Amur Carp fish seed with KMnO_4 @1-3 ppm or NaCl @4% before stocking
- 3.5. Maintain stocking density (8000 nos/ha) as recommended
- 3.6. Maintain stocking ratio of 4:3:3 (surface feeder: column feeder: bottom feeder)

Key considerations:

- Avoid stocking fish seeds on weight basis and follow stocking recommended species in the recommended ratio and density
- Adjust stocking density based on harvesting strategy (depending on whether fish to be harvested as 'hotel size fish' or to be grown >1 kg size; single stocking multiple harvesting)

4. Crop Calendar

- 4.1. Follow the crop calendar given below to plan fish production to reach the market during the ban period in Assam i.e. April-June when fish demand and fish prices are high
- 4.2. Ensure stocking during July-August so that the fishes grow to marketable size by March

Key considerations:

- Fingerlings of different species should be made available for stocking in August.
- Advanced nursing on-farm reduce seed cost substantially and enable availability of required seed on-farm for stocking.
- Early season stocking enables farmers to harvest fish in April to June when fish supply in market is low and fetch better price.
- Short production cycle (March – May) for production of hotel size fish can be followed in the areas prone to flood damage.
- Follow crop calendar as recommended below (where possible).

July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
Preparation	Stocking	Growing							Harvesting		

5. Water quality management

5.1 Monitor the pond regularly (early morning and late in the afternoon):

5.2 Low DO stress is likely:

- if the pond is dark green with Secchi disc visibility of <15 cm (DO stress occurs either very early in the morning or when the day is cloudy)
- if pond water is dark/black coloured with foul smell (eg, H₂S)

5.3 Check pH after heavy rainfall and apply lime if pH is <6.5

Key considerations:

- Low DO stress symptom: – fish start gasping for air on pond surface OR sometimes even die if DO is too low. If such symptoms are noticed, partially exchange pond water or sprinkle water over the pond to increase DO level.
- Mechanical aerators for large farms; for small ponds pumping water and creating like fountain over the pond can be done.
- If pond water colour turns black/dark, drain some bottom water and top up with new water.

6. Feeding

6.1 Follow feeding options, depending on the feed availability and costs:

- Floating pellets
- Sinking pellets
- Farm-made feed
- Combination of commercial formulated feed and farm-made feed

6.2 Adjust feeding rate as recommended

Key considerations:

- Ideal to have 25% CP in grow out feed:
- broadcast floating pellets from specific side of the pond along with the wind
- place feed in feeding trays (made of locally available materials) submerged in the pond
- put feed in perforated bags and submerge just below the water surface so that fish can browse feed and where feed loss is minimal
- Adjust feeding based on fish biomass (feeding table to be provided to the farmer)
- It is advised to cook farm made feed to make it more palatable.
- Daily feeding rate range from 5% of total fish biomass (for fry/fingerlings) and 1.0% for large size fish
- Feeding rate also needs to be adjusted based on feed quality, plankton richness in the pond, etc.
- Avoid feeding around mid-day/when temperature is very high/during the cloudy/rainy days

7. Regular Sampling

7.1 Do sampling every month to assess the growth and health of the cultured fishes:

- Monitor the length and weight of different species of fishes stocked.
- Use the information for adjusting the feeding rates
- Check for the presence of external parasites on the body surface, fins, gills etc. and also for the presence of lesions or wounds.

8. Disease Management

8.1 There are a number of preventive measures farmers can use to reduce the risk of diseases and parasitic infection:

- Stock pond with healthy, disease-free seed.
- Disinfect all tools used in fish culture operations.
- Avoid overcrowding.
- Follow proper feeding, fertilization and water quality management practices.
- Conduct routine screening for any sign of disease/stress.
- Record all clinical signs; take pictures of clinical signs, and record of number of dead fish.

- Remove all moribund and dead fish, and bury them far away from the pond.
- Bring any unusual mortality to the attention of responsible authorities and assist them to collect sick and moribund samples for laboratory testing.
- Follow the suggestion of the responsible authority for disease management.

9. Harvesting

9.1 Follow harvesting strategy based on culture system type – generally single stocking multiple harvesting:

- Harvest fishes when they grow to 800g -1 kg. size
- Condition fish before sending to live fish market

Key considerations:

- Harvesting strategy largely depends on purpose, market preference, growout system, etc.
- Harvest fish 1 day before sending to market and put them in nylon hapa; stop feeding at least 24 hours before sending to market

10. Marketing

10.1 Send fish to market either early in the morning or late in the afternoon

10.2 Preferably send fishes live to the market to get better price

Key consideration:

- Avoid transportation of fish when temperature is high (mid-day to early afternoon)
- While transporting live fish maintain biomass based on volume of water to avoid mortality

11. Environmental Care

11.1 Make sure that fish farming activities are not causing harm to surrounding aquatic and terrestrial environment

Key consideration:

- Avoid draining pond water and sludge directly to nearby water bodies
- Properly dispose dead fish (they should be removed immediately from the pond and buried properly)
- Properly dispose the feed bags, fertilizer bags, used bottles and containers

12. Record Keeping:

12.1 Maintain records of all farm activities, stocking details, inputs, sampling details, harvest details, selling and also consumption.

12.2 Use record books provided under the project for keeping records

12.3 Ensure the records are updated periodically by the Project staff or Department officials during their visit to the farm

Annexure 6.

Draft BMP for Polyculture of Carps with Freshwater Prawns

Assam Agribusiness and Rural Transformation Project

Fishery Sub-Component



Better Management Practices for Polyculture of Carps with Freshwater Prawns– Draft



APART Project Fishery Sub-component

Better Management Practices for Polyculture of Carps with Freshwater Prawns– Draft

Giant freshwater prawn, *Macrobrachium rosenbergii* is commonly known as “SCAMPI”. It is widely distributed in Southeast Asia and found in most river systems in India. It is highly valued due to its high price, large size, rapid growth, good taste and high export demand. These prawns inhabit rivers, canals, estuaries and coastal waters in nature. It can also be cultured in freshwater as well as slightly brackish water.

Polyculture of giant freshwater prawn along with Indian major carps is becoming popular compared to monoculture among fish farmers due to the high cost of management, low survival and differential growth of prawn under monoculture systems. The polyculture of prawn with fish is commonly practiced in the northern parts of Karnataka, Andhra Pradesh, Orissa, West Bengal and Punjab. The presence of fish in a polyculture system serves as a biological control over development of zooplankton, phytoplankton and filamentous algae, which otherwise result in ecological instability of the pond ecosystem. Since the prawn under polyculture with fish derives its nutrition by utilizing the natural pond productivity and left-over fish feed, faecal matter of fish, etc., there is no need for a separate high-cost prawn feed.

The inclusion of freshwater prawns in a polyculture system almost always has synergistic beneficial effects, which include:

- More stable dissolved oxygen levels,
- The reduction of predators,
- Coprophagy (the consumption of fish faeces by prawns), which increases the efficiency of feed,
- Greater total pond productivity (all species),
- The potential to increase the total value of the crop by the inclusion of a high-value species.

Aquaculture systems in Assam are characterized by polyculture of Indian major carps with Rohu and Catla as major species. Freshwater prawn farming is an environment friendly aquaculture farming system and Assam’s agro-climatic condition is suitable for freshwater prawn production. Addition of freshwater prawn along with carps in polyculture system can provide additional profit and minimize the waste in the pond ecosystem. The freshwater prawn has a very high market value, is preferred by consumers in Assam besides having good export potential. It is in this context, scientifically validated better management practices (BMPs) covering the full life cycle of the farming operation is essential. APART project is committed to supporting sustainable intensification of polyculture of carps with fresh water prawn and plans to achieve a substantial income from fresh water prawn with carp polyculture system.

Developing scalable aquaculture technology packages and BMP interventions are vital to realizing sustainable increase in aquaculture production and thereby narrowing the fish demand-supply

gap in the future. BMP interventions should aim at sustainable intensification of aquaculture without creating adverse socio economic and environmental impacts. BMPs refer to a set of standardized management guidance that are developed, based on existing practices and associated risks, as determined in consultation with scientists and farming practitioners and relevant industry stakeholders. BMP development process should consider the technical, environmental, social and economic issues associated with farming and must be location and context specific. New innovations should be routinely incorporated into BMPs to facilitate continuous improvement in farming practices. BMPs are dynamic and evolving.

Promoting the implementation of BMPs across the value chain for freshwater prawn in carp polyculture systems could benefit the state through improved productivity, reduced negative environmental and social consequences. Such BMPs and technical guidelines should cover areas of general husbandry, pond preparation, water quality, feed management, disease management, record keeping, harvest and post-harvest handling. This first version of the freshwater prawn im carp polyculture BMP is complementary to the Package of Practice (PoP) developed by College of Fisheries, AAU, Assam under the APART project. BMP provided by WorldFish will be an evolving document and will be updated considering the results and experiences of Year 1 of polyculture of carps with freshwater prawn demonstration under the ongoing APART project.

The purpose of BMP guidelines is to increase awareness and build capacity of carp farmers, extension service providers, and other value chain actors on better management practices for fresh water prawn with carp polyculture in Assam.

BMP recommendations:

1. Pond Preparation

- 1.1. Drain pond; remove sludge from the bottom and let it dry
- 1.2. Keep pond dyke clean from bushes to prevent hiding of predators
- 1.3. Repair dyke as necessary to control water seepage
- 1.4. Repair inlet and outlet pipes
- 1.5. Place bamboo or other substrates – which help in colonizing periphyton and also help in protecting from poaching of fish
- 1.6. Apply lime, distributing evenly over the pond surface, at a recommended rate
- 1.7. Consider fencing the sides of pond using nylon net/bamboo/any other locally available materials or bio-fencing using plants like Assam Lemon, Chitranalla

Key considerations:

- Drain annually OR once in two years – depending on the need
- Liming is must if soil pH in the pond is <6.5
- Consider using cost-effective materials for fencing or provide bio-fencing

2. Water Filling and fertilization of pond

- 2.1. Fill pond, maintain water depth between 1.5-2.0 m. Filter water with double lined nylon nets if water from natural sources is used for filling.
- 2.2. Fertilize pond, using chemical fertilizers @ 28 kg N and 21 kg P/ha with Urea and single super phosphate OR other fertilizers readily available in local market.
- 2.3. Consider applying recommended doses of organic manure (livestock manure/chicken manure/compost) in heaps in one or two pond corners enclosed with the help of split bamboo. Consider application of bio-fertilizers like Anabaena – Azolla complex

Key considerations:

- Install a water level measuring pole marked at 1m, 1.5m and 2 m to check water level
- Since prawns are cannibalistic in nature and also having territorial behaviour so they necessitate special hiding arrangement during moulting phase. It is to be noted that moulting is the only process of growth of shellfish.
- During moulting phase prawns are weak and are exposed with soft muscle. Thus to prevent the cannibalistic nature during moulting plastic pipe, hollow bamboo, beetalnut leaves, coconut leaves, tyres, tree branches, etc need be provided as hiding arrangement.
- Monitor plankton growth using Secchi disc (maintain adequate greenness i.e., around 30 cm Secchi disc visibility) and adjust subsequent fertilization rate (clear water = low in natural food; too green = high plankton density)

3. Stocking

- 3.1. Pond is ready to stock once water turns green (rich in plankton – natural food for fish)
- 3.2. Acquire fish seed from Department hatcheries, Multiplication centres or Registered Private hatcheries (where available, acquire improved Jayanti Rohu)
- 3.3. Procure fish seeds of 10 cm size for stocking. If fingerlings are small (<5 cm), nurse them in nursery pond until they grow to 10 cm; feed the fingerlings with high- quality feed
- 3.4. Stock Fresh water prawn juveniles of size 4-6 cm and maintained stocking density (7500 nos/ha) as recommended
- 3.5. Treat the seeds with KMnO_4 @ 1-3 ppm or NaCl @ 4% before stocking
- 3.6. Maintain fish stocking density (2500 - 3500 nos/ha) as recommended
- 3.7. Maintain stocking ratio of 5:5 (surface feeder: column feeder)

Key considerations:

- Avoid stocking fish seeds on weight basis and follow stocking recommended species in the recommended ratio and density
- Adjust stocking density based on harvesting strategy (depending on whether fish to be harvested as 'hotel size fish' or to be grown >1 kg size; single stocking multiple harvesting)

4. Crop Calendar

- 4.1. Follow the crop calendar given below to plan fish production to reach the market during the ban period in Assam i.e. April-June when fish demand and fish prices are high
- 4.2. Ensure stocking during July-August so that the fishes grow to marketable size by March

Key considerations:

- Fingerlings of different species should be made available for stocking in August.
- Advanced nursing on-farm reduce seed cost substantially and enable availability of required seed on-farm for stocking.
- Early season stocking enables farmers to harvest fish in April to June when fish supply in market is low and fetch better price.
- Short production cycle (March – May) for production of hotel size fish can be followed in the areas prone to flood damage.
- Follow crop calendar as recommended below (where possible).

July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
Preparation	Stocking	Growing							Harvesting		

5. Water quality management

- 5.1 Monitor the pond regularly (early morning and late in the afternoon):
- 5.2 Low DO stress is likely:
 - if the pond is dark green with Secchi disc visibility of <15 cm (DO stress occurs either very early in the morning or when the day is cloudy)
 - if pond water is dark/black coloured with foul smell (eg, H₂S)
- 5.3 Check pH after heavy rainfall and apply lime if pH is <6.5

Key considerations:

- Low DO stress symptom:– fish start gasping for air on pond surface OR sometimes even die if DO is too low. If such symptoms are noticed, partially exchange pond water or sprinkle water over the pond to increase DO level.
- Mechanical aerators for large farms; for small ponds pumping water and creating like fountain over the pond can be done.
- If pond water colour turns black/dark, drain some bottom water and top up with new water.

6. Feeding

- 6.1 Follow feeding options, depending on the feed availability and costs:
 - Sinking pellets
 - Farm-made feed

- Combination of commercial formulated feed and farm-made feed
- 6.2 Adjust feeding rate as recommended

Key considerations:

- Ideal to have 30% CP in grow out feed:
- broadcast feed to pond from the surround dykes
- place feed in feeding trays (made of locally available materials) submerged in the pond
- put feed in perforated bags and submerge just below the water surface so that fish can browse feed and where feed loss is minimal
- Feed can also be given in check trays placed 2-3 m away from the dyke for better feed management
- Adjust feeding based on fish biomass (feeding table to be provided to the farmer)
- It is advised to cook farm made feed to make it more palatable.
- Daily feeding rate range from 5% of total fish biomass (for fry/fingerlings) and 1.0% for large size fish
- Feeding rate also needs to be adjusted based on feed quality, plankton richness in the pond, etc.
- Avoid feeding around mid-day/when temperature is very high/during the cloudy/rainy days

7. Regular Sampling

7.1 Do sampling every month to assess the growth and health of the cultured fishes and prawns:

- Monitor the length and weight of different species of fishes stocked.
- Monitor the length and weight of cultured prawns.
- Use the information for adjusting the feeding rates
- Check for the presence of external parasites on the body surface, fins, gills etc. and also for the presence of lesions or wounds.

8. Disease Management

8.1 There are a number of preventive measures farmers can use to reduce the risk of diseases and parasitic infection:

- Stock pond with healthy, disease-free seed.
- Disinfect all tools used in fish culture operations.
- Avoid overcrowding.
- Follow proper feeding, fertilization and water quality management practices.
- Conduct routine screening for any sign of disease/stress.
- Record all clinical signs; take pictures of clinical signs, and record of number of dead fish.
- Remove all moribund and dead fish, and bury them far away from the pond.
- Bring any unusual mortality to the attention of responsible authorities and assist them to collect sick and moribund samples for laboratory testing.
- Follow the suggestion of the responsible authority for disease management.

9. Harvesting

9.1 Follow harvesting strategy based on culture system type – generally single stocking multiple harvesting:

- Harvest fishes when they grow to 800g -1 kg. size
- Harvest prawns when they grow more than 50 g in size.
- Condition fish before sending to live fish market

Key considerations:

- Harvesting strategy largely depends on purpose, market preference, growout system, etc.
- Harvest fish 1 day before sending to market and put them in nylon hapa; stop feeding at least 24 hours before sending to market
- Large prawns (>50 g) may be harvested using seine net of suitable mesh size after four months of culture, which should continue once every 3-4 weeks thereafter for the next 3-4 months. The prawns may be finally harvested after 8 months of culture by complete dewatering.

10. Marketing

10.1 Send fish to market either early in the morning or late in the afternoon

10.2 Preferably send fishes live to the market to get better price

Key consideration:

- Avoid transportation of fish when temperature is high (mid-day to early afternoon)
- While transporting live fish maintain biomass based on volume of water to avoid mortality

11. Environmental Care

11.1 Make sure that fish farming activities are not causing harm to surrounding aquatic and terrestrial environment

Key consideration:

- Avoid draining pond water and sludge directly to nearby water bodies
- Properly dispose dead fish (they should be removed immediately from the pond and buried properly)
- Properly dispose the feed bags, fertilizer bags, used bottles and containers

12. Record Keeping:

12.1 Maintain records of all farm activities, stocking details, inputs, sampling details, harvest details, selling and also consumption.

12.2 Use record books provided under the project for keeping records

12.3 Ensure the records are updated periodically by the Project staff or Department officials during their visit to the farm.

Annexure 7.

Report of Training program on PIT-Tagging of Brood Fishes

Report of Training program on PIT-Tagging of Carp Brood Fishes

A PIT tag is a small radio transponder that contains a specific code, which allows individual fish, as well as amphibians, reptiles, birds and even rocks, to be assigned a unique 10 or 15 digit alphanumeric identification number. PIT-tags are implemented into the peritoneal cavity of fish to individually identify fish, with the use of an external scanner that transfers data directly to electronic data capture systems. They serve as a permanent coded marker and as reliable as a fingerprint for identification of an individual. Tagging allows identification of individual candidate brood fish for broodstock management purpose at multiplication centres and hatcheries.

A one day training program on PIT-Tagging of Carp Brood fishes was organized by WorldFish on 9-12-2020 in Collaboration with Department of Fisheries, Govt. of Assam under World Bank funded project APART. Dr. R. Suresh, Resident Consultant, WorldFish-Assam, Dr. Sanjay Sarma, Fishery coordinator, ARIAS Society, Dr. D. J. Sharma, Nodal officer, Department of Fisheries, DOF officials and TEF under APART attended the training program. Total 9 nos. of wild collected Carp Brood fishes were tagged with Passive Integrated Transponder (PIT) tag. The following parameters were recorded-

PIT Tag	Species	Sex	Weight (kg)	Total length	Std. length	Depth	date
201308177479	Catla	Female	2.02	52 cm	42 cm	17 cm	9/12/2020
201308177456	Catla	Female	2.10	52 cm	42 cm	16 cm	9/12/2020
201308177477	Catla	Female	2.65	53 cm	43 cm	19 cm	9/12/2020
201308177440	Catla	Female	2.63	53 cm	43 cm	17 cm	9/12/2020
201308177447	Catla	Female	2.45	53 cm	41 cm	17 cm	9/12/2020
201308177493	Catla	Female	2.29	53 cm	43 cm	16.5 cm	9/12/2020
201308177473	Catla	Female	2.72	54 cm	43 cm	17 cm	9/12/2020
201308177419	Catla	Female	2.20	54 cm	43 cm	16 cm	9/12/2020
201308177499	Catla	Female	2.40	53 cm	44 cm	16.5 cm	9/12/2020



Annexure 8.

**World Bank Mid-Term Review Mission Schedule
14th-21st Dec 2020**

APART: Tentative Schedule of Virtual World Bank Mid Term Review (MTR) Mission: 14-21 Dec 2020

Day-1: 14th Dec. 2020 (Monday)

Meeting number: **180 652 4406**

Meeting password: **UySrmJFC376**

Time	Presentation/Discussion	Remarks	World Bank Team Participants
01.30 pm - 03:00 pm	Start-up meeting	Presentation by PCU	All
03:00 pm - 04:00 pm	Progress- Agri value chains	Presentation by OPIU Agri Presentation by AAU (all crops) IRRI, CIP, World Veg, ICAR-DRMR to be present	Arvind, Mridula, Philarisa
04:00 pm - 05:00 pm	Progress- Horti value chains & presentation on sweet potato by CIP	Presentation by OPIU Hort &FP AAU, CIP & World Veg to be present	Arvind, Mridula, Philarisa
05:00 pm - 06:00 pm	Progress- Fishery value chain	Presentation by OPIU Fisheries, CoF (Raha) IRRI, WorldFish to be present	Arvind, Mridula, Philarisa

Day-2: 15th Dec. 2020 (Tuesday)

Meeting number: **180 144 7001**

Meeting password: **4dvJJsjj3T3**

Time	Presentation/Discussion	Remarks	
1:30 pm- 3:30 pm	Progress Handloom, Textiles & Sericulture value chain	Presentation by OPIU Sericulture Presentation by OPIU Handloom & Textiles	Vinayak, Mridula, Philarisa
04:30 pm - 5:30 pm	Progress- Piggery value chain & cross cutting support to formal & informal dairy	Presentation by AHVD ILRI & ICAR-NRCP to be present	Helen, Mridula, Philarisa
05:30 pm - 06:30 pm	Progress- Formal dairy value chain	Presentation by OPIU WAMUL & NDDB	Helen, Mridula, Philarisa
06:30 pm - 07:30 pm	Progress- Informal dairy value chain	Presentation by OPIU Dairy ILRI to be present	Helen, Mridula, Philarisa

Day-3: 16th Dec. 2020 (Wednesday)

Meeting number: **180 236 4692**

Meeting password: **MtmVDDJn842**

Time	Presentation/Discussion	Remarks	
01:30 pm - 2:30 pm	Progress-FPC/CSC	Presentation by SIMFED-CTAN Presentation by PCU on in house FPC Program Commodity OPIUs to be present	Bekzod, Arvind, Vinayak, Mridula, Philarisa
02:30 pm - 3:30 pm	Progress- Market Intelligence Cell (MIC)	Presentation by OPIU-ASAMB	Ravishankar, Mridula, Philarisa
03:30 pm - 04:30 pm	Progress- Financial Education & Counseling (FEC)	Presentation by PCU on FEC	Ajai, Mridula, Philarisa

04.30 pm - 05.30 pm	Progress- Challenge fund	Presentation by EY on Challenge Fund	Ajai, Mridula, Philarisa
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Day-4: 17th Dec. 2020 (Thursday)

Meeting number: **180 337 8136**

Meeting password: **Fmi3k2f7KH5**

Time	Presentation/Discussion	Remarks	
01:30 pm - 2:30 pm	Progress- ABIP	Presentation by EY OPIU I&C to be present	Bekzod, Mridula, Philarisa
02:30 pm - 3:30 pm	Progress-EDPF/Kshyamata	Presentation by OPIU I&C supported by PCU OPIU I&C to be present	Bekzod, Mridula, Philarisa
03:30 pm - 04.30 pm	Progress-Stewardship Council	Presentation by Deloitte OPIU I&C to be present	Bekzod, Arvind, Vinayak
04.30 pm - 05.30 pm	Progress- CDTA	Presentation by Grant Thornton OPIU I&C to be present	Adarsh, Mridula, Philarisa

Day-5: 18th Dec. 2020 (Friday)

Meeting number: **180 148 3014**

Meeting password: **XpkAytzm243**

Time	Presentation/Discussion	Remarks	
01:30 pm - 2:30 pm	Progress- civil works	Presentation by PWRD OPIU ASAMB, ASWC & OPIUs with civil works implemented through PWRD, to be present	Bekzod, Jolly, Mridula, Philarisa
02:30 pm - 3:30 pm	Progress Spot Exchange Study	Presentation by Deloitte ASAMB to be present	Ravishankar, Mridula, Philarisa
03:30 pm - 04.30 pm	Progress- Env safeguards	Presentation by PCU All OPIUs to be present	Asferachew, Mridula, Philarisa
04.30 pm - 05.30 pm	Progress- Social safeguards	Presentation by PCU All OPIUs to be present	Mridula, Philarisa,

Day-6: 19th Dec. 2020 (Saturday)

Meeting number: **180 945 6071**

Meeting password: **J3RhMg4ywA2**

Time	Presentation/Discussion	Remarks	
01:30 pm - 2:30 pm	Progress-IEC	Presentation by Outreach-Insight PCU team to be present	Vinayak, Mridula, Philarisa
02:30 pm - 3:30 pm	Progress- M&E	Presentation by Sutra PCU team to be present	Bekzod, Mridula, Philarisa
03:30 pm - 04.30 pm	Progress on procurements	Presentation by PCU team	Robin, Mridula, Philarisa
04.30 pm - 05.30 pm	Discussion on restructuring proposal	PCU & concerned OPIUs to be present	Bekzod, Mridula, Philarisa

Day-7: 20th Dec. 2020 (Sunday)-Holiday

Day-8: 21st Dec. 2020 (Monday)

Meeting number: **180 130 0322**

Meeting password: **q4WvPXapK63**

10.00 am- wrap up meeting chaired by Chief Secretary (World Bank team to join virtually)

Annexure 9.

**WorldFish Activities in APART- World Bank MTR
Presentation 14th Dec 2020**



WorldFish Activities-World Bank Mid-Term Review (Aug 2018 - Till date)

R. Suresh, Resident Consultant

14 December, 2020



Contract Details

Title: Technical assistance for the Fisheries Sub-Component of the World Bank Funded APART

- ❖ Contract signed on 10th August, 2018
- ❖ Contract effectiveness from 17th August, 2018
- ❖ Period under report – August, 2018 to till date

Sl. No	WorldFish Deliverables
1	Deliverable A: Inception Report
2	Deliverable 1: Promoting adoption of BMPs for sustainable intensification of aquaculture
3	Deliverable 2: Up-gradation of Existing Indian major carp hatcheries to produce certified seed
4	Deliverable 3: Multiplication Centres (MCs) for genetically improved fish strains
5	Deliverable 4: Improving productivity of beels
6	Deliverable 5: Improving Fish Value Chains
7	Deliverable 6: Carp-Mola polyculture
8	Deliverable 7: Improving impact of aquaculture and beel fisheries on human nutrition
9	Deliverable 8: Promoting climate resilient smart fish production technologies
10	Deliverable 9: Gender transformative approaches in support of sustainable aquaculture and beel fisheries
11	Deliverable 10: Capacity building of DoF Officers

WorldFish Activities in a Nutshell

SI no.	Deliverables	Work done
1	Promoting adoption of BMPs for sustainable intensification of aquaculture.	5 BMPs and 4 records book developed in Assamese, printed and distributed among beneficiaries and non-beneficiaries, BMP for Polyculture of Carps, BMP for production of Mola and SIS along with Carps, BMP for Paddy cum fish integrated farming, BMP for Beel Fisheries, BMP Quality Carp Seed Production Pond record book for Polyculture of Carps, Polyculture of carps with Mola-SIS, Record book for Paddy cum fish integrated farming, Polyculture of carps with FW Prawn FPG level BMP training conducted
2	Up-gradation of Existing IMC hatcheries to produce certified seed.	Technical support provided for selection of Department Hatcheries, Recommendation given for upgradation of hatcheries, Quality Broodstock collected from Wild, Tagged and reared Works completed in 5 Hatcheries, Trial seed production conducted in 3 hatcheries,
3	Multiplication Centres (MCs) for genetically improved fish strains.	Technical support provided for selection of Department Farms for establishment of multiplication centres. Recommendation given for establishment of multiplication centres. Work in progress in all multiplication centres.
4	Improving productivity of Beels.	Technical support provided for selection of suitable Beels for intervention Baseline survey conducted in the selected beels Specific recommendation on technical intervention and governance for the selected beels under preparation
5	Improving Fish Value Chains.	Fish value chain study completed. Existing Fish Value Chain, Fish feed value chain and Scope for Fish products identified Virtual Workshop on Fish Value Chain in Assam conducted Final report Submitted to ARIAS and DOF.

WorldFish Activities in a Nutshell

SI no.	Deliverables	Work done
6	Carp-Mola polyculture.	Carp-Mola Polyculture promoted in 10 project Districts with 64 beneficiaries in 2019-20, 175 beneficiaries targeted in 2020-21 Training provided to DOF officials, APART staff and farmers on identification of brood stock source, harvesting of Mola and SIS, conditioning, transport, stocking and partial harvesting. Mola-SIS establishment in Polyculture system assessed.
7	Improving impact of aquaculture and Beel fisheries on human nutrition.	Social behavior communication change materials for Nutrition promotion campaign under preparation.
8	Promoting climate resilient smart fish production technologies.	Paddy Fish farming as a climate resilient technology promoted in 9 districts among 297 farmers in 150 ha. In 2020-21 target for 300 ha. Potential area for expansion of Paddy-Fish farming in Assam identified. Joint evaluation of short-term fish culture technology taken up along with College of Fisheries, Raha.
9	Gender transformative approaches in support of sustainable aquaculture and Beel fisheries.	Gender sensitization workshop conducted for Department Officials and APART Staff, Gender Scoping Study conducted in 7 project districts, Gender Integration workshop conducted for Department Officials and APART Staff, Gender strategy and gender recommendation for Fish value chain under preparation.
10	Capacity building of DoF Officers.	Two National exposure visits for Department Officials and APART Staff to Odhisa organized, One International visit to Cambodia and Myanmar for Department Officials organized Technical support for conducting three ToT programs organized by College of Fisheries, Raha Training provided to Department Officials and APART Staff on Polyculture of Carps, Mola-SIS farming, Beel fisheries, Nutrition sensitive aquaculture, GIS in fisheries and aquaculture Gender integration and MIS data collection

Deliverable 1 : Promoting adoption of BMPs for sustainable intensification of aquaculture

- Conducted Writeshop on Better Management Practices on 27th June, 2019**
- BMPs Developed:**
 - ❖ **Better Management Practices for Carp Polyculture**
 - ❖ **BMP for Production of Mola & SIS along with Carps**
 - ❖ **BMP for Paddy cum Fish Integrated Farming**
 - ❖ **BMP for Beel Fisheries Management**
 - ❖ **BMP Quality Carp Seed Production**
- Conducted BMP Training for the DOF officials and APART Staff**
- Conducted 25 FPG level FGD on BMP trainings for creating awareness and adoption of BMPs in 12 districts.**
- Pond Record book for Carp polyculture**
- Pond Record book for Polyculture of carps with Mola-SIS**
- Pond Record book for Polyculture of carps with Freshwater Prawns**
- Record book for paddy cum fish integrated farming**

Writershop on Better Management Practices for Fishery Activities under the Fishery Sub-component of APART



Better Management Practices

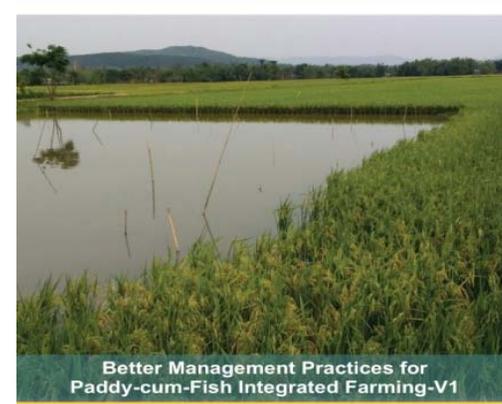
Assam Agribusiness and Rural Transformation Project
Fishery Sub-Component



Assam Agribusiness and Rural Transformation Project
Fishery Sub-Component



Assam Agribusiness and Rural Transformation Project
Fishery Sub-Component



Assam Agribusiness and Rural Transformation Project
Fishery Sub-Component



Assam Agribusiness and Rural Transformation Project
Fishery Sub-Component



List of Focus Group Discussion (FGD) conducted till date

Date	District	Name of the village where the FGD conducted	Name of FPG attended	Nos. of participants
7-12-2020	Darrang	Dhoronipur	Novouday FPG	55
9-1-2020	Barpeta	Dabuliaparaduttakuchi	Jyutimatshya APART and NatunDiganta APART	23
10-1-2020	Barpeta	Pub-borola	Tarunjyoti FPG	21
24-2-2020	Golaghat	NabajyotiGaon	Adarsha FPG	28
	Lakhimpur	Phukondoloni	Phukondoloni FPG	20
25-2-2020	Jorhat	SolmaraBormerGaon	APART sorbodoiya fish production group and APART shymolmeenutpadan got	33
	Lakhimpur	KolakhuwaGaon	Kolakhuwa FPG	27
	Lakhimpur	Bishnupur	Bishnupur FPG and Horibor FPG	28
26-2-2020	Sivasagar	MothiachigaGohainGaon	MothiachigaGohainbeelcommitee	34
12-3-2020	Sonitpur	AkabastiMirigaon	AkabastiMiri FPG	51
13-3-2020	Kamrup	Hajo	NobodoiMilijuli FPG, MonahkuchiPragatishil FPG and DihinaHainadi FPG	32
	Kamrup	GariakothGaon	Gariakoth FPG and BaraliyaMatsyapalan FPG	39

List of Focus Group Discussion (FGD) conducted till date

Date	District	Name of the village where the FGD conducted	Name of FPG attended	Nos. of participants
14-3-2020	Sonitpur	Bogapani	Bogapani FPG	37
4-09-2020	Goalpara	Madang	Tripakhik Meen Palon Baniya Got	20
7-09-2020	Nalbari	Hatkhatora	Sira Seuj FPG	20
21-09-2020	Nagaon	Korchung	Sonai poria FPG	20
28-09-2020	Lakhimpur	Dharmapur	Kiran Meen Palon FPG	20
29-09-2020	Lakhimpur	Dharmapur	Adarsha Meen Palon FPG	20
30-09-2020	Lakhimpur	Borgoia Gendhali	Nawboicha Meen Palon FPG	20
01-10-2020	Sonitpur	Kalbari		20
06-10-2020	Golaghat	Biakorua gaon	SK FPG & Paragjyoti FPG	42
07-10-2020	Golaghat	Merapani	Neel FPG	20
08-10-2020	Jorhat	Gendhali	Surojmukhi Matchya Utpadon Got	25
09-10-2020	Jorhat	Horu Sorai	APART Bhogdoi poria Matchya Utpadon got	20
04-12-2020	Goalpara	Kothakuthi	Kothakuthi Udoyaman Matchya Baniya Got	28
Total 25 training completed				703

Focus Group Discussion cum BMP training



Pond Record Books


 सत्यमेव जयते

Assam-Agribusiness and Rural Transformation Project

Pond Record Book for Polyculture of Carps

Year		Farmer Producer Group	
Beneficiary Name		Cluster	
Farmer's Code		District	

In Partnership with






 सत्यमेव जयते

Assam-Agribusiness and Rural Transformation Project

Record Book for Paddy cum Fish Integrated Farming

Year		Farmer Producer Group	
Beneficiary Name		Cluster	
Farmer's Code		District	

In Partnership with







 सत्यमेव जयते

Assam-Agribusiness and Rural Transformation Project

Pond Record Book of Polyculture of Carps with Mola

Year		Farmer Producer Group	
Beneficiary Name		Cluster	
Farmer's Code		District	

In Partnership with






 सत्यमेव जयते

Assam-Agribusiness and Rural Transformation Project

Pond Record Book for Polyculture of carps with Freshwater Prawn

Year		Farmer Producer Group	
Beneficiary Name		Cluster	
Farmer's Code		District	

In Partnership with





Deliverable 2: Up-gradation of Existing Indian major carp hatcheries to produce certified seed

- ❖ *WorldFish experts visited existing hatcheries in different districts for Selection of hatcheries*
- ❖ *Visited private commercial hatcheries in Assam*
- ❖ *FGD with Private Hatchery operators*
- ❖ *Technical recommendation for upgradation of hatcheries*
- ❖ *Inspection of ongoing upgraded hatcheries*

Selected Hatcheries:

- a. Islamabad Fish Farm, Cachar district
- b. Ulubari Fish Seed Farm, Kamrup District
- c. Bormuri Fish Farm, Lakhimpur District
- d. Joysagar Fish Farm, Sivasagar District
- e. Amaranga Fish Farm, Kamrup District

World Fish Experts visit to different Department and Private Fish Seed farms



Visit to On-going upgraded Hatchery



Deliverable 3: Multiplication Centres (MCs) for genetically improved fish strains

- ❖ *Promote production of seed of genetically improved fish strain*
- ❖ *Technical support*
- ❖ *Collection of quality broodstock from natural sources*
- ❖ *PIT tagging of broodstock*

Selected Hatcheries:

- J. B. Garh Fish Farm, Nagaon District
- Rangia Fish Seed Farm, Kamrup District
- Matilang Fish Farm, Goalpara District
- Islamabad Fish Farm, Cachar District

PIT (Passive integrated Transponder) Tagging of Broodfish

Tagging of Broodstock in Hatcheries using PIT Tags for Identification of broodstock for quality seed production



PIT-Tagging of Broodfishes in Ulubari Fish Farm



Tagging program – Record Keeping

❖ Following Parameters were recorded:

PIT Tag	Species	Sex	Weight (kg)	Total Length	Std. Length	Depth	Date
201308177479	Catla	Female	2.02	52 cm	42 cm	17 cm	9/12/2020
201308177456	Catla	Female	2.10	52 cm	42 cm	16 cm	9/12/2020
201308177477	Catla	Female	2.65	53 cm	43 cm	19 cm	9/12/2020
201308177440	Catla	Female	2.63	53 cm	43 cm	17 cm	9/12/2020
201308177447	Catla	Female	2.45	53 cm	41 cm	17 cm	9/12/2020
201308177493	Catla	Female	2.29	53 cm	43 cm	16.5 cm	9/12/2020
201308177473	Catla	Female	2.72	54 cm	43 cm	17 cm	9/12/2020
201308177419	Catla	Female	2.20	54 cm	43 cm	16 cm	9/12/2020
201308177499	Catla	Female	2.40	53 cm	44 cm	16.5 cm	9/12/2020

About WorldFish

WorldFish is an international, not-for-profit research organization that works to reduce hunger and poverty by improving fisheries and aquaculture. It collaborates with numerous international, regional and national partners to deliver transformational impacts to millions of people who depend on fish for food, nutrition and income in the developing world. Headquartered in Penang, Malaysia and with regional offices across Africa, Asia and the Pacific, WorldFish is a member of CGIAR, the world's largest global partnership on agriculture research and innovation for a food secure future.

For more information, please visit www.worldfishcenter.org