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v1

National Agricultural Technology Project- Phase II

ENVIRONMENTAL MANAGEMENT FRAMEWORK

(VOL-I)

FOR PUBLIC RELEASE

MINISTRY OF AGRICULTURE
MINISTRY OF FISHERIES & LIVESTOCK
GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH

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EXECUTIVE SUMMARY

ES 1: Introduction

The National Agricultural Technology Project (NATP) is a multi-dimensional long term project of the Government of Bangladesh with financial support from International Development Association (IDA), International Fund for Agricultural Development (IFAD) and USAID. The Ministry of Agriculture (MoA) and the Ministry of Fisheries and Livestock (MoFL) are implementing the project with a focus on improving research, extension, and to a limited extent, supply chains, to achieve farm productivity enhancement and smallholders income increase. The first phase of the NATP was implemented between 2008 and 2013. The additional financing phase for NATP is being implemented from 2013. The proposed second phase of the NATP (NATP-2) is expected to cover 65% of the district/upazilas comprising both Phase I district/upazilas and new district/upazilas.

ES 2: National Agriculture Technology Project 2 (NATP-2)

The Project Development Objective (PDO) of the NATP-2 is to 'enhance the agricultural productivity of smallholders through better research and extension and improve their market access through better integration in selected value chains'. To that effect, NATP-2 will support decentralized, demand-driven agricultural research and extension services, and promote market oriented smallholder production. NATP-2 will also support access to markets for smallholder farmers by facilitating their linkages with selected value chains, contributing in turn to increased farm income and to the sustainability of farmer groups and producer organizations formed by the project. NATP-2 will achieve the PDO: (i) by strengthening the capacity of the National Agricultural Research System (NARS) and the extension services to generate and diffuse agricultural technologies aimed at increasing farm productivity; and (ii) by promoting the sustainability of existing and newly created farmer groups and producer organizations by strengthening their linkages with markets.

The components of the project are:
Component 1: Enhancing the Agricultural Innovation System
Component 2: Supporting crop development
Component 3: Supporting fisheries development
Component 4: Supporting livestock development
Component 5: Project Management and Coordination

ES 3: Environmental Management Framework (EMF)

Two of the World Bank's environmental safeguard policies are relevant to the NATP-2 project. These are the OP 4.01 on Environmental Assessment and OP 4.09 on Pest Management. In tune with the requirements of the OP 4.01, the NATP-2 has been classified as a Category B project and this Environmental Management Framework (EMF) has been prepared. In tune with the requirements of the OP 4.09, a Pest Management Plan (PMP) has been prepared for the NATP-2 (and is available as a separate document).

Both the NATP-1 and its Additional Financing have developed and implemented EMFs. The NATP-2 project builds upon the design of the NATP-1 but includes an increased focus on livestock and fisheries – as well as additional activities in agriculture. Hence, an EMF has been prepared for the NATP-2 project building upon the base of the NATP-1. The framework approach has been adopted to provide general guidelines and procedures for environmental management of sub-projects to be supported under NATP-2.

The purpose of the EMF of the NATP-2 is to integrate environmental concerns into the identification, design and implementation of all sub-project interventions in order to ensure that the sub-project

interventions are environmentally sustainable. The EMF will contribute to environmental sustainability by:

- Excluding the sub-projects that pose serious threat to the environment
- Preventing and/or mitigating any negative environmental impact that may emerge from the subproject interventions
- Enhancing environmental outcomes of the activities implemented under individual sub-projects

The EMF will facilitate compliance with the policies, acts, and rules of the Government of Bangladesh and environmental safeguard policies of the World Bank.

The methodology of development of this EMF involved: review of EMFs of NATP-1 and NATP-AF; review of relevant national and international laws and regulations; review of relevant data and documents on the status and environmental issues pertaining to the agriculture, livestock and fisheries sectors in Bangladesh; and, field visits and consultations in project districts.

ES 4: EA Categorization of NATP Interventions

The NATP-2 supports a range of activities including research, training, ICT, infrastructure support (lab renovation and upgrading), agricultural equipment, agro-processing units, cold storage units, market yards, kitchen gardens, dairy and goat rearing units, milk chilling and processing centres, small scale slaughter houses, feed manufacturing units, bio-gas units, fish rearing (mono and poly culture), fish processing units, etc. The potential environmental impact of these activities varies depending on the nature, scale and location of the activity. Considering these criteria, a well as the categorization stipulated under the Environment Conservation Rules 1997, the sub-projects in NATP-2 have been categorized into 3 categories: those that require Limited Environment Assessment (LEA), those that required Detailed Environment Assessment (DEA) and those that do not need any assessment.

ES 5: Environment Management Process

The following principles will be followed in the overall environmental management of sub-projects to be implemented under the NATP-2:

- Activities with severe negative environmental impacts will not be supported by NATP-2.
- Activities involving financing of CIGs, POs, SMEs and research proposals will go through environmental screening and assessment and will have sub-project specific Environmental Management Plans (EMPs).
- All supported activities will ensure compliance with the relevant 'Environmental Codes of Practice'.
- 'Environmental Enhancement Measures' will be recommended specifically to address adaptation needs in the context of climate change.

The following steps or ***supporting elements*** ensure systematic implementation of the system for environmental management:

- Reviewing negative list of attributes
- Categorization of sub-projects
- Environment assessment of sub-projects and development of EMP
- Institutional arrangements
- Capacity building
- Monitoring
- External Environmental Audit

Table E1: Categorization of Sub-projects in Agriculture Sector based on EA requirement

Component	*Specific Interventions*	*Sub project*	*Major Negative Impacts*	*NATP Categorization based on EA requirement*
Supporting Crop Development and Value Chains	Enhancing skills of extension workers	Trainings Information material	Nil	Excluded from EA requirement
	Promotion of good agricultural practices developed under NATP-1	Extension on package of practices and inputs	Use of chemical fertilizers, pesticides leading to pollution	LEA
	Integrated Pest Management (IPM) and climate-smart technologies demonstration	demonstrations	Pesticides recommended under IPM without protective gear or in high dosages, application before harvest, open disposal of pesticide containers leading health hazards, pollution.	LEA
		Trainings	Nil	Excluded from EA requirement
	Promoting mechanization	Tractors, tillers, harvesters	High energy use and GHG emissions, safety issues in use	LEA
		Processing equipment	High energy use and GHG emissions, Health and safety issues	LEA
	Capacity building to address women's needs	Trainings	Nil	Excluded from EA requirement
	Homestead gardening with Women groups	Kitchen gardens	Use of chemical inputs for gardens and non-local seeds	LEA
	Aggregation of commodities	Market yards (CCMC)	Construction of CCMC, Flocking of vehicles, noise and air pollution due to transport. Issues in storage.	LEA
	Infrastructure improvement for value chains	Construction of processing units	Disposal of construction wastes. Environmental health and safety	LEA
	Agro-processing for the value chains selected	Processing machinery Cold storage	Use of local resources for infrastructure – soil, water. Use of machinery demanding high energy use. Issues of safety in processing using machinery. High use of energy	DEA

Table E2: Categorization of sub-projects in Livestock Sector based on EA requirement

Nature of sub-projects to be supported	*Potential negative environmental impacts*	*DoE Categorization*	*NATP Categorization based on EA requirement*
Modern management for dairy, sheep and buffalo farming	• Land/vegetation degradation due to overgrazing • Pollution from poor manure management. • Health risk (zoonotic diseases) from poor housekeeping and handling. • Promotion of only exotic breeds may lead to gradual extinction of indigenous breeds.	Orange-A (10 cattle heads or below in urban areas and 25 cattle heads or below in rural areas) Orange-B (above 10 cattle heads in urban areas and above 25 cattle heads in rural areas)	LEA (10 cattle heads or below in urban areas and 25 cattle heads or below in rural areas) DEA (above 10 cattle heads in urban areas and above 25 cattle heads in rural areas)
Introduction of sheep and buffalo rearing in low lying areas	• Land/vegetation degradation due to overgrazing. • Pollution from poor manure management. • Health risk (zoonotic diseases) from poor housekeeping and handling. • Promotion of only exotic breeds may lead to gradual extinction of indigenous breeds.	Orange-A (10 cattle heads or below in urban areas and 25 cattle heads or below in rural areas) Orange-B (above 10 cattle heads in urban areas and above 25 cattle heads in rural areas)	LEA (10 cattle heads or below in urban areas and 25 cattle heads or below in rural areas) DEA (above 10 cattle heads in urban areas and above 25 cattle heads in rural areas)
Enhanced beef fattening using urea-molasses-straw mixes	• Health risk from unauthorized use of anabolic steroids and feed additives.	Orange-A (10 cattle heads or below in urban areas and 25 cattle heads or below in rural areas)	LEA
Goat rearing using slat system for housing	• Land/vegetation degradation due to overstocking. • Pollution from poor manure management. • Health risk (zoonotic diseases) from poor housekeeping and handling.	None	LEA
Production management for high yielding varieties of green fodder; Promotion of salinity tolerant fodder varieties in coastal areas	• Pollution and health risk from improper selection and use of pesticides. • Groundwater depletion due to over-extraction of for irrigation. • Promotion of only exotic species/varieties may lead to gradual extinction of knowledge on native fodder species/varieties.	None	LEA
Silage and hay production	• Health risk from poor housekeeping and handling. • Groundwater contamination due to leachate from silos.	None	LEA

Nature of sub-projects to be supported	*Potential negative environmental impacts*	*DoE Categorization*	*NATP Categorization based on EA requirement*
Chaff cutters	• Safety risk during operation.	None	LEA
Mini-feed compounding and mixing units	• Health risk from unauthorized use of anabolic steroids and feed additives. • Health risk from poor housekeeping and handling.	Orange-B	DEA
Bio-gas production	• Pollution and health risk from poor slurry management. • Groundwater contamination due to leachate from slurry pit.	None	LEA
Manure management in dung pits	• Pollution and health risk from poor management. • Groundwater contamination due to leachate from pit.	None	LEA
Milking machines	• Contamination of milk due to poor hygiene practices.	None	LEA
Milk collection	• Contamination of milk due to poor hygiene practices.	None	LEA
Chilling plants for milk conservation	• Contamination of milk due to poor hygiene practices. • Pollution due to improper disposal of waste water.	Orange-B	DEA
Milk pasteurization	• Contamination of milk due to poor hygiene practices. • Pollution due to improper disposal of waste water.	Orange-B	DEA
Preparation of indigenous dairy products	• Health risk from poor housekeeping and handling. • Health risk from use of unauthorized additives such as food colourants.	Orange-B	DEA
Improved small-scale slaughterhouses and dressing houses for safer meat production	• Health risk (zoonotic diseases) from poor housekeeping and handling. • Contamination of meat due to poor hygiene practices. • Pollution due to improper disposal of solid and liquid wastes.	Orange-B	DEA
Input marketing	• Increase in use of chemical inputs in	None	LEA

Nature of sub-projects to be supported	*Potential negative environmental impacts*	*DoE Categorization*	*NATP Categorization based on EA requirement*
	agriculture. • Increase in use of hazardous chemical pesticides. • Risk of trading in banned or sub-standard chemical inputs. • Health risk from poor housekeeping and handling.		
Commodity marketing	• Health risk from poor housekeeping and handling.	None	LEA
Marketing facilities for sale of goats	• Health risk (zoonotic diseases) from poor housekeeping and handling.	None	LEA

Table E3: Categorization of Sub-projects in Fisheries Sector based on EA requirement

Specific Interventions	*Sub project*	*Major Negative Impacts*	*DoE Categorization*	*NATP Categorization based on EA requirement*
Promote productivity through an integrated approach	Specific fish production models	Water pollution due to use of pellet feed, chemicals etc. Loss of local fish diversity	Not Specified	LEA
	Quality fish seed	Pollution due to use of pellet feed, antibiotics, chemicals etc.	Not Specified	LEA
	Quality fish feed	Chemical residues in ingredients, unsafe storage etc.	Not Specified	LEA
	Application of fisheries management tools	Nil	Not Specified	None
Semi intensive fish production models to promote productivity and profitability	Genetically Improved Farm (GIF) Tilapia monoculture	Water pollution due to use of pellet feed, chemicals etc. Loss of local fish diversity	Not Specified	LEA
	GIF Tilapia polyculture	Water pollution due to use of pellet feed, chemicals etc. Loss of local fish diversity	Not Specified	LEA
	Pangas polyculture	Water pollution due to use of pellet feed, chemicals etc. Loss of local fish diversity	Not Specified	LEA
	Freshwater prawn polyculture	Water pollution due to use of pellet feed, chemicals, antibiotics etc. Loss of local fish diversity	Not Specified	LEA

Specific Interventions	*Sub project*	*Major Negative Impacts*	*DoE Categorization*	*NATP Categorization based on EA requirement*
	Koi polyculture	Water pollution due to use of pellet feed, chemicals etc. Loss of local fish diversity	Not Specified	LEA
	Carp polyculture	Water pollution due to use of pellet feed, chemicals etc. Loss of local fish diversity	Not Specified	LEA
Assured supply of quality fish seed	Fish seed of GIF tilapia	Water pollution due to use of pellet feed, chemicals etc. Loss of local fish diversity.	Not Specified	LEA
	Stock improvement of climbing perch and Thai pangas	Water pollution due to use of pellet feed, chemicals etc. Loss of local fish diversity	Not Specified	LEA
Promotion of climate resilient innovative technologies	Use of short seasonal water bodies	Loss of fish diversity due to introduction of new species, water pollution due to feed application in excess quantities	Not Specified	LEA
	Tolerant species in saline areas	Loss of fish diversity due to introduction of new species, water pollution due to feed application in excess quantities	Not Specified	LEA
	Innovations like cage fish culture, pen farming in open water		Not Specified	LEA
Increasing local extension agents	Recruitment, training programmes	Nil	Not Specified	None
Promoting farmer to farmer extension	Training programmes	Nil	Not Specified	None
Strengthening research extension linkage	Outreach programmes	Nil	Not Specified	None
Formulated fish feed with local ingredients	Fish feed preparation units	Chemical residues in ingredients affecting feed quality, dust emissions during preparation, unsafe storage leading to pest, mold infestation, etc.	Orange B	DEA
Investment in development and enhancement of value chains	Improvement and management of fish marketing infrastructure	Local resource use during construction – water, soil etc. Loss of vegetation. Disposal of construction waste etc. Pollution in the surroundings due to disposal of fish waste, drainage problems due to water, bad odour etc.	Not Specified	DEA

Specific Interventions	*Sub project*	*Major Negative Impacts*	*DoE Categorization*	*NATP Categorization based on EA requirement*
	Preservation of fish	use of chemicals like formalin for preserving wet fish, use of pesticides for storage of dry, salted fish	Orange B	DEA
	Setting up cold storage structures	Issues during construction – local resource use, waste disposal etc. High energy requirement for running cold storage, waste water and waste disposal	Orange B	DEA
	Setting up small ice plants	Local resource use and pollution during construction – disposal of debris, loss of vegetation soil etc. Use of low quality water for making ice spoiling the fish, open disposal of ice contaminated with fish slime leading to health issues. High energy requirement for running the plants.	Orange B	DEA
	Food safety and feed quality	Use of harmful chemicals, toxic dyes in preservation of fish. Practice of not washing fish at different stages leading to bacterial growth. Disposal of waste water.	Orange B	DEA
Institutional capacity enhancement for quality control	Training programmes	Nil	Not specified	None

Table E4: Categorization of Sub-projects in Research Sector based on EA requirement

Specific Interventions	*Sub project*	*Major Negative Impacts*	*NATP Categorization based on EA requirement*
ICT for research - Development web-based platform.	Creating web platform	Nil	Excluded from EA requirement
Capacity Building	Trainings	Nil	Excluded from EA requirement
Renovation of Infrastructure – equipment and laboratories	Infrastructure support	Construction related health and safety issues	Excluded from EA requirement
Agricultural research (lab and field based)	Research	Inputs and technologies to be used in the proposed research may have negative impacts	Screening & LEA

ES 6: List of Negative Attributes and Sub-projects

In order to avoid any serious negative impact on environment an exclusion list of sub-projects that will not be supported under the NATP-2 has been agreed upon. This list includes the following sub-projects/negative attributes:

- Activities that are not in compliance with the laws and regulations of the Government of Bangladesh (including Environment Conservation Rules 1997, Food Safety Act 2013, Animal Slaughter and Meat Control Act 1957).
- Activities that involve pesticides that fall in WHO classes IA, IB and II and pesticides banned by the Government of Bangladesh.
- Activities involving significant conversion or degradation of critical natural habitats (mangroves, wetlands, etc.).
- Activities within Protected Areas (Wildlife Sanctuaries and National Parks).
- Activities that involve significant conversion or degradation of natural habitats and cultural property resources.
- Activities that involve withdrawal of groundwater for irrigation or other purposes where arsenic contamination higher than national standard (currently 50 ppb).
- Activities that involve Genetically Modified Organisms (GMOs) that have not been approved by an independent panel of internationally recognized experts, and cleared by the World Bank and the Government of Bangladesh.

ES 7: Environmental Assessment of Research, Technology Demonstration & Value Chains

Environmental Assessment is undertaken to identify the possible impacts and required mitigation measures for a sub-project. In NATP-2 selection of sub-projects on research, technology demonstration and value chains will follow a two step environmental assessment process.

Limited Environmental Assessment (LEA): This level of environmental assessment is for those sub-projects that have relatively limited, localized and reversible environmental impacts and are classified as Green or Orange-A by the Department of Environment. The Tables E1 to E4 outline the category of activities/sub-projects that will require LEA. The LEA is carried out by the Upazila Department Officers and by the proponents of research proposals. Research concept notes (CN) will go through an environment screening using a list of exclusion criteria. CNs that are eligible for funding will carry out Limited Environmental Assessment on the full proposal.

Detailed Environmental Assessment (DEA): This level of environmental assessment is for those sub-projects that have relatively significant, large scale and/or irreversible environmental impacts and are classified as Orange-B or Red by the Department of Environment. If LEA recommends carrying out further assessment for any sub-projects where environmental problems are complex and will have cumulative impacts and mitigation measures are not easily available, then DEA can be conducted. The DEA is carried out by the safeguard specialist to be based at the PIU.

ES 8: Preparation of Sub-project Environmental Management Plans (EMPs)

The outcome of the environmental assessment will be a sub-project Environmental Management Plan (EMP).

Following the LEA, the Upazila Department Officer or the research proponent will prepare an EMP that will become an integral part of the sub-project proposal. The EMP will identify the technical and financial support required to implement the necessary mitigation measures. The technical support required by the CIGs, POs and SMEs to implement the mitigation measures will form part of the Upazila Extension Plan. The financial support required to implement the mitigation measures will be included in the sub-project cost.

The major components of an EMP include: mitigation measures, enhancement measures, Environmental Code of Practices, estimation of cost of EMP, environmental monitoring, and institutional arrangement for implementation of EMP.

Table E4: Identified Mitigation Measures for Sub-projects

Sub-project	*Impacts*	*Mitigation Measures*
Agriculture (Crop Production)	Use of hazardous pesticides impacting human and environmental health Unsafe use of pesticides impacting human health Overuse of pesticides impacting human and environmental health Imbalanced used of chemical fertilizers impacting environmental health Over-extraction of water for irrigation leading to groundwater depletion Inefficient use of water for irrigation leading to wastage Use of Arsenic contaminated water leading to impact on human health Loss of native crop varieties	Integrated Pest Management as per Pest Management Plan Organic Farming Soil test based fertilizer application Ensure safe distance between 2 tube wells Use of efficient irrigation methods (sprinkler, drip, etc.) Water quality testing to check suitability of water for irrigation Conservation of native crop varieties
Agriculture/ Livestock/ Fisheries (Agro-processing)	Use of non-permissible chemical (e.g. calcium carbide for ripening, non-food grade dyes for colouring, anabolic steroids and feed additives, etc.) impacting human/livestock health Overuse of pesticides or use of hazardous pesticides (e.g. to control pests during storage) impacting human/livestock and environmental health Over-consumption of energy and water due to inefficient machinery and/or manufacturing processes Use of Arsenic contaminated water leading to impact on human/livestock health Air pollution from activities such as milling, de-husking, etc. Noise pollution from milling, shelling, crushing, de-husking, etc. Water pollution due to release of untreated effluent Un-hygienic practices may contaminate food/feed Occupational health and safety hazards from improper use of machinery	Use only permissible, food-grade chemicals and packaging materials Integrated Pest Management to manage food/feed pests as per Pest Management Plan Location Clearance and Environment Clearance as applicable from Department of Environment Use of energy and water efficient equipment and manufacturing processes Use of water that meets permissible standards for human consumption Locate unit at safe distance from residential area (ensure Location and Environmental Clearance from DOE) Ensure effluent treatment and discharge as per plan approved by Department of Environment. Use of protective gear by workers for safety and sanitation
Livestock (Dairy and Goat Rearing)	Land/vegetation degradation due to overgrazing Pollution from poor manure management	Location Clearance and Environment Clearance as applicable from Department of Environment Fodder management incorporating fodder cultivation, stall feeding, rotational grazing,

Sub-project	*Impacts*	*Mitigation Measures*
	Health risk (zoonotic diseases) from poor housekeeping and handling Gradual extinction of native livestock breeds due to promotion of only exotic breeds	supplementary feeds, use of chaff cutter, etc. Improved composting methods – pit composting Maintenance of safe distance between manure pit and water sources Construction of shed location and design as per technical recommendations Maintenance of shed sanitation and hygienic handling Promotion of improved indigenous breeds
Livestock (Slaughter house)	Health risk (zoonotic diseases) from poor housekeeping and handling Un-hygienic practices may contaminate meat Pollution due to improper disposal of solid and liquid wastes Over-consumption of energy and water due to inefficient machinery and/or manufacturing processes Occupational health and safety hazards from improper use of machinery	Design of the slaughter house adheres to basic standards including elevated clean floor, drainage system and water, roof railings for evisceration, training to butchers on ante-mortem examination for un-healthy animals, hygienic slaughter, meat handling and waste management Locate unit at safe distance from residential area (ensure Location and Environmental Clearance from DOE) Implementation of prescribed cleaning and disinfection protocol for the equipment and the plant Ensure effluent treatment and discharge as per plan approved by Department of environment Use of energy and water efficient equipment and manufacturing processes Use of protective gear by workers for safety and sanitation
Fisheries (Fish Production)	Fish farms obstructing flow of canals, interfering with wetlands Contamination of nearby water bodies Pollution due to use of chemical feeds, fertilizers and antibiotics Loss of native fish diversity and aquatic diversity due to introduction of new and improved species Disposal of wastes	Selection of varieties that does not pose threat to local species. Use natural feeds like rice bran to the extent possible in recommended doses. Species selection in polyculture should be as per recommendation of the DOF – and designed to avoid competition with other species and aquatic life. Use natural manures, fertilizers in recommended doses Use of permitted chemicals and antibiotics in recommended doses.
Fisheries (Fish Processing)	Location of the units and construction having negative impact on environment High energy requirement for processing machinery, ice units etc. Usage of harmful chemicals like formaldehyde and toxic dyes for storage Pollution due to disposal of wastes like fish gut, scales and waste water from ice units and waste ice Use of contaminated water or arsenic polluted water for processing or for preparing ice Un-hygienic environment, un hygienic practices in handling (not using protective gear, etc.)	Location of units away from the residential areas with Location Clearance and Environment Clearance from Department of Environment. Use safe quality water for processing (washing and making ice). Safe disposal of wastes (fish gut contents, scales, used ice, waste water etc. safely as per prescribed standards Avoiding use of non permitted chemicals for preservation Use of permitted preservatives as per recommended doses. Energy efficiency in processing, storage

Sub-project	*Impacts*	*Mitigation Measures*
Infrastructure development for research facilities	Cutting of trees for construction of research facilities leads to loss of greenery. Open disposal of debris after construction may obstruct drains, fill up wetlands, etc. Dust and noise pollution during construction are harmful to local environment and nearby residents. High energy use for construction activities.	Ensure Location Clearance and Environment Clearance from Department of Environment. Avoid cutting trees to extent possible and replant where necessary. Dispose construction waste in landfills or reuse to the possible extent. Take necessary precautions like spraying water to control dust pollution. Use energy efficient machinery and material to the extent possible.
Agricultural research – lab based	Risk of contamination, infection, injury, poisoning, etc., due to poor occupational safety practices in laboratories Risk of contamination, infection, injury, poisoning, etc., due to poor biomedical and chemical waste management practices in laboratories Loss of native crop varieties Introduction of invasive species/varieties	Use of protective gear by workers for safety and sanitation Safe disposal of laboratory wastes as per prescribed rules for biomedical waste management and effluent release Conservation of native crop varieties

ES 9: Institutional Arrangements

The PMU of NATP-2 has the overall responsibility of ensuring implementation of the EMF. The PIUs will ensure implementation of the prescribed system and procedures for their respective sectors.

Table E5: Roles and Responsibilities on Environmental Management

Level	*Sector and Role*	*Responsibility*
Union	Agriculture: Sub-Assistant Agriculture Officer Livestock: Community Extension Agents for Livestock Fisheries: Local Extension Agent for Fisheries	Provide technical support to CIGs, POs and SMEs on implementation of mitigation measures, Environmental Codes of Practice and Enhancement Measures.
Upazila	Agriculture: Upazila Agriculture Officer Livestock: Upazila Livestock Officer Fisheries: Upazila Fisheries Officer	Undertake environmental screening of all CIG, PO and SME sub-projects. Undertake LEA of low-impact sub-projects. Coordinate the functioning of the Union staff at union level. Monitor the implementation of mitigation measures. Environmental Codes of Practice and Enhancement Measures.
District	Agriculture: District Agriculture Officer Livestock: District Livestock Officer Fisheries: District Fisheries Officer	Monitor the implementation of mitigation measures, Environmental Codes of Practice and Enhancement Measures. Coordinate and support the Upazila staff in implementation of the EMF.
Research proponent	Focal Point for Environmental Safeguards in research institution	Undertake screening and LEA of research sub-project proposals. Ensure implementation of mitigation measures as identified in the EMP.

Level	*Sector and Role*	*Responsibility*
National	Focal Point for Environmental Safeguards in PIU/PMU	Review environmental documentation in sub-project proposals to ensure that the prescribed environmental management practices (as described in this EMF) are implemented. Ensure that excluded activities are not financed. Provide assistance to district and upazila level staff in undertaking environmental screening and assessment of CIG, PO and SME sub-projects. Verify sub-project environmental categorization. Provide assistance to subproject proponent institutions (supported for research and institutional capacity building) in determining environmental issues, identifying and implementing actions from the Environmental Code of Practices, required documentation, etc. Undertake Detailed Environmental Assessment. Procure services of consultants to undertake External Environmental Audit of the NATP-2 project. Conduct formal and on the job training for upazila and district level functionaries.

ES 9: Capacity Building Plan

The environmental soundness of the interventions supported under the NATP depend to a large extent on the capacity of the beneficiary communities and line department staff to identify and suitably address any environmental impacts, and, to actively promote better environmental management. The plan for capacity building of the communities and line department staff at various levels in each sector is included in the EMF.

ES 10: Monitoring Plan

Monitoring to identify and suitably address any issues is important for the effective implementation of the EMF. Two types of monitoring will be implemented: i) sub-project environmental effect monitoring and ii) environmental impact monitoring. Effect monitoring of technology demonstration sub-projects as well as monitoring of research and value chains will be on annual basis.

ES 11: External Environmental Audit

The PIU/PMU will hire an independent consultant agency to undertake an external environmental audit of the project. This audit will be undertaken prior to the mid-term review.

ES 12: Budget

The budget provision for EMF implementation under different sectors is as below:
Agriculture – 40922000 (BDT)
Livestock – 26446800 (BDT)
Fisheries – 29436000 (BDT)
Research – 5800000 (BDT)

ACRONYMS/ABBREVIATIONS

AEO	Agriculture Extension Officer
APR	Annual Progress Report
BADC	Bangladesh Agricultural Development Corporation
BAEC	Bangladesh Atomic Energy Commission
BARC	Bangladesh Agricultural Research Council
BARI	Bangladesh Agricultural Research Institute
BFRI	Bangladesh Forestry Research Institute
BINA	Bangladesh Institute of Nuclear Agriculture
BJRI	Bangladesh Jute Research Institute
BLRI	Bangladesh Livestock Research Institute
BRAC	Previously NGO named Bangladesh Rural Advancement Committee: Now it is the brand name of that NGO
BRRI	Bangladesh Rice Research Institute
BSRI	Bangladesh Sugarcane Research Institute
BTRI	Bangladesh Tea Research Institute
BWDB	Bangladesh Water Development Board
CF	Community Facilitators
CG	Community Group
CIG	Common Interest Group
CSO	Community Support Organizations
DAE	Department of Agricultural Extension
DLS	Directorate of Livestock Services
DOE	Department of Environment
DOF	Department of Fisheries
DPHE	Department of Public Health Engineering
EA	Environmental Assessment
ECA	Environmental Conservation Act
ECR	Environmental Conservation Rules
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
EMP	Environmental Management Plan
ES	Environmental Screening
FAO	Food and Agriculture Organization
FIAC	Farmers' Information and Advice Centers
FRI	Fisheries Research Institute
GMO	Genetically Modified Organisms
GoB	Government of Bangladesh
HSE	Health, Safety and Environmental risk
IAPP	Integrated Agricultural Productivity Project
IEE	Initial Environmental Examination
IPM	Integrated Pest Management
IPNM	Integrated Pest and Nutrient Management
IPNS	Integrated Plant Nutrient System
IUCN	International Union for Conservation of Nature
LEA	Limited Environmental Assessment
LEAF	Local Extension Agent For Fisheries
LGD	Local Government Division
LGED	Local Government Engineering Department
LGSP	Local Government Support Project

LLP	Low Lift Pump
M&E	Monitoring and Evaluation
MDG	Millennium Development Goal
MIS	Management Information System
MOA	Ministry of Agriculture
MoEF	Ministry of Environment and Forest
MOI	Ministry of Industry
MoLF	Ministry of Livestock and Fisheries
MoLGRDC	Ministry Of Local Government, Rural Development and Co-Operative
NARS	National Agricultural Research System
NATP	National Agricultural Technology Project
NCS	National Conservation Strategy
OM	Operational Manual (of the World Bank)
OP	Operational Policies (of the World Bank)
PAST	Project Appraisal and Supervision Team
PDO	Project Development Objective
PMP	Pest Management Plan
PCU	Project Coordination Unit
PO	Participating (Partner) Organization
PSC	Project Supervision Committee
PTC	Project Technical Coordinator
PIU	Project Implementation Unit
SAAO	Sub-Assistant Agriculture Officer
SAPPO	Sub-Assistant Plant Protection Officer
SCA	Seed Certification Agency
SDF	Social Development Foundation
SGA	Seed Growers' Association
SRDI	Soil Resources Development Institute
STW	Shallow Tube Well
TNA	Training Needs Assessment
TOT	Training of Trainers
UFO	Upazila Fisheries Officers
UNDP	United Nations Development Program
UNO	Upazila Nirbahi Officer (Executive Officer at the Upazila)
UP	Union Parishad
UAO	Upazila Agricultural Officer
URT	Upazila Resource Team
UZ	Upazila
VDC	Village Development Committee
WB	World Bank
WQS	Water Quality Standard

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1 Introduction

1.1 Project Background

The National Agricultural Technology Project (NATP) is a multi-dimensional long term project of the Government of Bangladesh with financial support from International Development Association (IDA), International Fund for Agricultural Development (IFAD) and USAID. The Ministry of Agriculture (MoA) and the Ministry of Fisheries and Livestock (MoFL) are implementing the project with a focus on improving research, extension, and to a limited extent, supply chains, to achieve farm productivity enhancement and smallholders income increase. The first phase of the NATP was implemented between 2008 and 2013. The additional financing phase for NATP is being implemented from 2013. The proposed second phase of the NATP (NATP-2) is expected to cover 65% of the district/upazilas comprising 35% Phase I district/upazilas and 25% of new district/upazilas.

1.2 Objectives of the NATP-2 Project

The project development objective (PDO) of the NATP-2 is to 'enhance the agricultural productivity of smallholders through better research and extension and improve their market access through better integration in selected value chains'. To that effect, NATP-2 will support decentralized, demand-driven agricultural research and extension services, and promote market oriented smallholder production. NATP-2 will also support access to markets for smallholder farmers by facilitating their linkages with selected value chains, contributing in turn to increased farm income and to the sustainability of farmer groups and producer organizations formed by the project.

NATP-2 will achieve the PDO: (i) by strengthening the capacity of the National Agricultural Research System (NARS) and the extension services to generate and diffuse agricultural technologies aimed at increasing farm productivity; and (ii) by promoting the sustainability of existing and newly created farmer groups and producer organizations by strengthening their linkages with markets.

Sustainable intensification and diversification of agriculture through technological change requires an efficient and productive national agricultural technology system, comprising agricultural research (technology development and refinement) and agricultural extension (technology dissemination). This needs to be supported by appropriate value addition and market linkages through the strengthening of supply chains for high value agriculture. To that effect, while NATP-2 will continue supporting agricultural research and extension, it will have a stronger focus on market-oriented production, on value chains and on the participation of smallholders in those emerging market opportunities, than under NATP-1.

1.3 Project Components

There are 5 major components in the project, which are as follows:

Component 1: Enhancing the Agricultural Technology Generation (USD 52 million)
This component, led by the Project Management and Coordination Unit with implementation support from other agencies, will support the development of decentralized, demand-driven and integrated agricultural research. This component will include investments, capacity enhancement and technical assistance in areas launched under NATP-1 (such as sustainability of Common Interest Groups (CIGs) and emerging Producer Organizations (POs), rehabilitation of rural markets, technical advisory services), strengthening National Agricultural Research Institutes (NARI) (including investments in physical infrastructure), developing one-stop farmer advisory service centers. The component will also include a window for competitive research and matching grants under the Agricultural Innovation Fund.

Component 2: Supporting crop development (USD 66 million)
This component, coordinated by the Department of Agricultural Extension, will support the development of decentralized extension services and demand-driven research for crop production (including horticulture), post-harvest management and processing, and facilitate the integration of smallholder farmers in selected crop-based value chains (bananas, vegetables, and aromatic rice). This component would include investments, capacity enhancement and technical assistance in e.g. smallholder farm mechanization, seed testing facilities (with IFC), an electronic phytosanitary certification system (with IFC), food safety, agricultural commercialization, and promotion of smallholder-based commodity value chains. Financial incentives to smallholder farmers for the adoption of productivity enhancing and post-harvest loss reducing technologies, as well as support to private small and medium agro entrepreneurs in the selected value chains (e.g. food processing) will be secured through the corresponding AIF window.

Component 3: Supporting fisheries development (USD 37 million)
This component, coordinated by the Department of Fisheries, will support the development of decentralized extension services and demand-driven research for fish and aquaculture, and facilitate the integration of smallholder fish farmers in selected commodity value chains (tilapia, major carps, and shrimps). This component would include investments, capacity enhancement and technical assistance in e.g. the rehabilitation of fish ponds, food safety, quality improvement of fish feed and fingerlings, fish commercialization and the promotion of aquaculture-based commodity value chains. Financial incentives to smallholder farmers for the adoption of productivity enhancing and postharvest loss reducing technologies, as well as support to private small and medium agro entrepreneurs in the selected value chains (e.g. food processing) will be secured through the corresponding AIF window.

Component 4: Supporting livestock development (USD 47 million)
This component, coordinated by the Department of Livestock Services, will support the development of decentralized extension services and demand-driven research for livestock products, and facilitate the integration of smallholder farmers in selected commodity value chains (dairy, goat meat). This component would include investments, capacity enhancement and technical assistance in e.g. laboratory infrastructure and equipment, artificial insemination, fodder production and conservation, efficient biogas production, farm mechanization, food

safety, and the promotion of livestock-based commodity value chains. Financial incentives to smallholder farmers for the adoption of productivity enhancing and post-harvest loss reducing technologies, as well as support to private small and medium agro entrepreneurs in the selected value chains (e.g. food processing) will be secured through the corresponding AIF window.

Component 5: Project Management and Coordination (USD12 million)
Under this component a Project Management and Coordination Unit will be in charge of overall day-to-day project management and implementation, as well as coordination among the Project Implementing Units (PIUs) from the Ministry of Agriculture and Ministry of Food. This unit will have the operational, safeguards and fiduciary responsibility and be accountable for overall project performance.

1.4 Project Areas of NATP-2

NATP-2 will cover a total of 56 districts and span over a broad range of agro ecological zones across Bangladesh. The project will be implemented over a six year period in 270 *upazilas*; this includes 150 *upazilas* already covered under NATP-1, plus 120 new *upazilas*. New *upazilas* have been selected following the multi-criteria approach successfully applied under NATP-1 (among others: high prevalence of small and marginal farmers, agro ecologically stressed areas); a high potential for establishing a production and marketing cluster for one or more designated value chain commodities was added as a selection criteria for new *upazilas*.

1.5 Environment Management Framework

The operational policy OP 4.01of the World Bank requires Environmental Assessment (EA) of projects proposed to help ensure that the projects are environmentally sound and sustainable.

Both the NATP-1 and its Additional Financing have developed and implemented Environmental Management Frameworks (EMF). The NATP-2 project builds upon the design of the NATP-1 but includes an increased focus on livestock and fisheries – as well as additional activities in agriculture. Hence, an EMF has been prepared for the NATP-2 project building upon the base of the NATP-1. The framework approach has been adopted to provide general guidelines and procedures for environmental management of sub-projects to be supported under NATP-2.

The purpose of the Environmental Management Framework (EMF) of the NATP-2 is to integrate environmental concerns into the identification, design and implementation of all sub-project interventions in order to ensure that the sub-project interventions are environmentally sustainable. The EMF will contribute to environmental sustainability by:

- Excluding the sub-projects that pose serious threat to the environment
- Preventing and/or mitigating any negative environmental impact that may emerge from the subproject interventions
- Enhancing environmental outcomes of the activities implemented under individual sub-projects

1.6 Approach and Methodology

The approach to development of this EMP has been to build upon the experience of implementation of the EMFs for NATP-1 and NATP-Additional Financing (NATP-AF). The key lessons from the implementation of the EMFs for NATP-1 and NATP-AF and their incorporation into the EMF for NATP-2 is described below.

Table 1-1: Key Lessons from Implementation of EMF in NATP-1 and NATP-AF

Key lessons from implementation of EMF in NATP-1 and NATP-AF	*Influence on design of EMF for NATP-2*
Individual activities – especially of CIG members – are micro in scale. Considering the large number of these individual activities, conducting environmental screening and assessment for every individual activity is impractical.	Environmental screening and assessment is not to be conducted for every individual activity. Environmental screening is to be conducted for all sub-projects including all CIG sub-projects (each CIG will have 20-30 individual farmers), PO sub-projects, SME sub-projects and other sub-projects. Environmental assessment is to be conducted for a limited sub-set of sub-projects that have been identified as having potential to cause environmental impacts.
Considering that there are limited number of extension staff, the procedures for environmental screening and assessment have to be simple and practical.	The environmental screening and assessment process has been made simpler and more specific to the sub-project-type considering that in NATP-2 there will be on an average: • There will be 104 agriculture CIGs per Upazila, 30 livestock CIGs per Upazila and 20 fisheries CIGs per Upazila. • There is 1 Upazila Agriculture Officer supported by about 27 Sub Assistant Agriculture Officers (SAAOs) per Upazila. • There is 1 Upazila Livestock Officer to be supported by about 10 Community Extension Agents for Livestock (CEALs) per Upazila. • There is 1 Upazila Fisheries Officer to be supported by about 10 Local Extension Agent for Fisheries (LEAFs) per Upazila.

The methodology of development of this EMF involved:

- Review of EMFs of NATP-1 and NATP-AF.
- Review of relevant data and documents on the status and environmental issues pertaining to the agriculture, livestock and fisheries sectors in Bangladesh.
- Field visits and consultations at NATP-1 project sites in Belabo and Kapasia Upazilas.

A separate Environmental Evaluation Study of the NATP-1 has been undertaken. The results of this study is available in Vol – III of the EMF.

1.7 Structure of the EMF

The EMF provides information on environmental status and issues with regard to the agriculture, livestock and fisheries sectors. It provides sector-specific Environment Management Plans (EMPs) which detail the system and tools for environmental management of the sub-projects. It also describes the institutional arrangements, capacity building plan and monitoring strategy for ensuring effective implementation. The EMF facilitates compliance with the World Bank's environmental safeguard policies, and, with the relevant laws and regulations of the Government of Bangladesh.

The EMF is divided into 2 sections.

Section I contains the project background and baseline, and has the following 5 chapters:

- Chapter 1 provides overview of the project, project components, and EMF.
- Chapter 2 discusses in detail the project components, activities proposed under each component.
- Chapter 3 provides details on the legal and regulatory framework applicable to the project.

- Chapter 4 provides environmental baseline of the sectors – Agriculture, Livestock and Fisheries, highlighting the status and key issues.

Section II contains the Environment Management Plans, and has the following chapters:

- Chapter 5-8 present Environment Management Plans (EMPs) for the sectors Agriculture, Livestock, Fisheries and Agricultural Innovation System. The EMPs include details on the potential negative impact of the proposed sub-project activities, suggested mitigation measures, enhancement measures, and the Environmental Code of Practice. The EMPs also provide details on the implementation arrangements – institutional arrangements, capacity building plan, monitoring plan, etc.
- Chapter 9 provides information on public consultation and disclosure.

2 Description of NATP-2 Project

2.1 Project Components

2.1.1 Component 1 – Enhancing the Agricultural Technology Generation

The objective of this component is to improve the performance of agricultural research by supporting the development of innovative agricultural technologies and by strengthening research institutions. NATP-2 will support a demand-driven and market-oriented approach to agricultural research that takes into account: (i) the multiplicity of actors involved in agricultural technology generation, (ii) the need for increasing agricultural output per unit of shrinking arable land while adapting to climate variability and longer-term climate change, (iii) the evolving domestic demand for diversified, safer and more nutritious food, and (iv) opportunities for supplying international markets with selected agricultural and food products. Component 1will support this research agenda by enhancing the institutional capacity of BARC and the National Agricultural Research Institutes (NARIs), by funding research through competitive grants, and by helping to build human capital for agricultural research. The component will also finance a number of activities (including specific studies, policy notes, training, research-extension linkages, and others) in support of the implementation of the 2012 BARC Act approved under NATP-1.

To strengthen the institutional capacity of the NARS, NATP-2 will invest in: (i) building the institutional and human capacity of the NARIs, including technical assistance to BARC, BFRI and BLRI, as well as support for human capital development through a limited number of funded doctoral studies; (ii) developing research infrastructure at NARI facilities (e.g., renovations, laboratories, equipment); and (iii) developing a comprehensive agricultural research and development web-based platform that will also serve as a research database and knowledge center for the country's agricultural innovation system.

To support the development of innovative agricultural technologies, mobilize available research capacity, stimulate scientific creativity and promote efficiencies in the research system, AIF-1will support: (i) a Competitive Research Grant Program (CRGP) for NARIs and other recognized in-country public and private research providers, as well as (ii) block grant funding for a limited number of comprehensive core research programs led by NARIs.

The objective of this component is to promote an integrated approach to achieve an increase in crop productivity, quality and output through the enhanced transfer of technologies, as well as a better integration of smallholder in selected crop value chains. To achieve the component's objective, NATP-2 will address the following features specific to crop development in the country:

- For sustainable advisory services for crop farmers and accelerated technology generation, transfer and adoption NATP-2 will build upon the presence at district, upazila and union level of public extension workers from DAE by enhancing their skills and the use of ICT-based extension methodologies.
- In the context of increased need for food safety and pesticide risk reduction as well as for climate-smart production techniques, special attention will be given to the promotion of

good agricultural practices developed under NATP-1, as well as identifying additional integrated pest management and climate-smart technologies for the safe and sustainable production of crops and horticultural products.

- To promote mechanization at field level to increase crop productivity and farm output, as well as to increase efficiency in crop handling, reduce post-harvest losses and to support processing, NATP-2 will provide financing opportunities through its Agricultural Innovation Fund (AIF).
- Collaboration with the private sector will be sought, given the potential of agro-processing for the value chains selected, as well as for the establishment of machinery hire-services. Besides specialized training to promote a more value chain oriented approach for crops, institutional strengthening will also cover investments in selected infrastructure improvement.
- Support a more integrated approach that strengthens the linkages between the various players in the agriculture innovation system by targeting the improvement of existing Horticultural Centers (DAE currently operates a network of 73 Horticultural Centers spread across the country).
- Enhancing the skills of public extension workers, from DAE by enhancing their skills and the use of ICT-based extension methodologies for sustainable advisory services.
- Promotion of good agricultural practices developed under NATP-1, as well as identifying additional integrated pest management and climate-smart technologies for the safe and sustainable production of crops and horticultural products.
- The project will ensure that DAE extension workers are adequately equipped to effectively and efficiently deliver their services to CIG and non-CIG farmers.
- In collaboration with DAE's Sub-Assistant Agriculture Extension Officers (SAAOs) and selected contact farmers (from CIGs and non-CIGs), the project will pilot farmer-to-farmer extension through the introduction of innovative ICT-based extension methods
- NATP-2 will also work with a network of agro-input dealers and jointly develop their potential role in a broader agricultural innovation system.
- Based on market demands this component will promote the formation of Producer Organisations (POs) to facilitate aggregation of commodity and input marketing for increased bargaining power, as well as access to information, technical service delivery and access to financial services.
- NATP-2 will aim under this component to add some 15.000 crop CIGs in 150 new upazilas to the 13.290 crop CIGs formed and trained under NATP-1 in 120 upazilas.
- Promoting mechanization at field level to increase crop productivity and farm output, as well as to increase efficiency in crop handling, reduce post-harvest losses and to support processing.
- Agro-processing for the value chains selected, as well as for the establishment of machinery hire-services in collaboration with private sector.
- Institutional strengthening through specialized training to promote a more value chain oriented approach for crops, which will also cover investments in selected infrastructure improvement.
- Build the capacity and develop the technical skills of local level actors, with a special focus on addressing women's needs. This component will also focus on focus on the creation of new and the strengthening of existing women's CIGs through the promotion of homestead gardening.

- The project support would also include the establishment of a national seed testing laboratory to analyze the quality of the seed marketed.
- Promoting integrated pest and crop management practices especially in horticulture and fruit-growing.
- Supporting the participation of researchers in the Upazila-, and District Extension Coordination Committees, which play a central role in coordinating the extension activities of various stakeholders and participation of researchers in farmer field days.

2.1.2 Component 3 – Supporting Livestock Development

The objective of this component is to promote an integrated approach to achieve productivity and output increases through enhanced technology transfer, service delivery as well as a better integration of livestock farmers in selected value chains. The value chains selected are dairy and goat meat. The key interventions under this component include:

- Support research for dairy and goat value chain components at the Bangladesh Livestock Research Institute (BLRI) and Central Cattle Breeding Station, Savar.
- Support to 4250 livestock CIGs in 150 new upazilas in addition to 3,921 livestock CIGs formed under NATP-1 in 120 upazilas through matching grants from the Agricultural Innovation Fund (AIF) to promote technology adoption and through training and skills development.
- Support to Producer Organizations through aggregate commodity and input marketing.
- Support to 2700 private Community Extension Agents for Livestock (CEALs).
- Expanding the outreach programs to large numbers of farmers.
- Support farmer-to-farmer extension as well as other forms of private technical advisory services.
- Support to demonstrate climate-resilient technologies to the farmers.
- Support from the AIF to farmer groups to adopt profitable high-cost technologies.
- Support to pilot community-level market intervention for dairy CIGs.
- Support to goat value chain including marketing activities and small-scale slaughter houses.
- Institutional capacity enhancement including infrastructure development and capacity building.
- Support to capacity and awareness building on food and feed safety issues in the value chain(s).
- Support to establish ICT infrastructure.

2.1.3 Component 4 – Supporting Fisheries Development

The objectives of the component 'Fisheries Development' is to promote an integrated approach to achieve productivity and output increases through technology transfer, as well as a better integration of fish farmers in selected value chains. The key interventions under the component include:

- Achieve productivity through integrated approach
    - promotion of specific fish production models involving improved fish varieties
    - better quality fish seed
    - introduction of appropriate fish feed
    - application of relevant fisheries management tools

    - creation of some more suitable market linkages for better access to markets and improved realization of value for the product.
- Specific semi-intensive fish production models included in the component are based on consideration of climate variation and resource availability in the project areas, in order to maximize productivity and profitability. These models include:
    - GIF Tilapia monoculture
    - GIF Tilapia polyculture
    - Pangas polyculture
    - Freshwater prawn polyculture
    - Koi polyculture and
    - Carp polyculture
- Assured supply of quality fish seed is an important intervention under this component. Under this the activities include:
    - stock improvement of Genetically Improved Farm Tilapia (GIFT) through a family selection program;
    - stock improvement of climbing perch (Thai koi) through brood stock replacement techniques; and
    - development of pure-line Thai pangas for stock improvement and mass seed production.
    - production and supply of quality fingerlings, including through private sector opportunities.
- Promoting formulated fish feed using locally available ingredients. The focus is to encourage the preparation of fish feed suitable to the endorsed production model and also to extend the regional feed formulation by taking into consideration the locally available ingredients which influence feed cost that accounts to over 60 to 70% of the total operational cost of fish farming.
- The promotion of climate-resilient and innovative technology is another key intervention under this component. Key interventions include:
    - bringing short-seasonal water bodies under aquaculture by implementing short production cycle models;
    - using tolerant species such as mullet and GIF Tilapia in salinity-impacted areas for aquaculture; and
    - promotion of innovative technologies such as cage fish culture and pen fish farming in open water in an environmentally sustainable manner.
- Under NATP-2, the number of private Local Extension Agents for Fisheries (LEAFs) is expected to be increased to some 3385. In order to extend quality professional service to farmers, the component will support LEAFs:
    - by providing them with adequate and regular technical training,
    - equipping them with essential "LEAF starter kits",
    - providing adequate ICTs and novel connectivity,
    - addressing the LEAFs' mobility constraints, and
    - by introducing a performance-based system that takes into account smallholders' satisfaction with the received advisory services on fish farming.
- The fisheries component will also support farmer-to-farmer extension, in line with the principles of NATP. Lead farmers will be trained and, where appropriate, equipped by the project in order to play a key role at the community level for the adoption by CIG and

non-CIG members of new technologies promoted by the project. Pilot will be in 100 unions.

- The component will have special focus on strengthening research-extension linkage. Technological packages will be carried in 3 packages:
    - technology demonstration in farmer's water body (real farming conditions) involving researcher, departmental extension staff, LEAF and farmer
    - farmer adoption trials involving extension staff, LEAFs and farmers
    - wider adoption of technological packages by farmers with the support of LEAFs.
- NATP-2 will aim to add some 4100 fisheries CIGs in 205 new upazilas to the 2670 fisheries CIGs formed and trained under NATP-1 in 120 upazilas. Direct support to eligible existing and new fisheries CIGs will be provided through matching grants from the Agricultural Innovation Fund (AIF) to promote technology adoption and through training and skills development. CIGs are also expected to benefit from Producer Organizations (POs) formed.
- The fisheries component will support investments in the development and enhancement of value chains. A special focus will be given for the preservation of fish along the value chain; this would include setting up cold storage facilities in selected market places for temporary preservation of iced fish, and the setting-up of small plants supplying ice to the CIGs. (i) the component will select specific fish varieties, based on market demand (for example,: Tilapia and major carps), for value chains under NATP-2; and (ii) support the organization of small-scale farmers in to business-oriented POs. The project will assist with the improvement of fish marketing infrastructure and management of such facilities. NATP II will support food safety, which is one of the major issues in fish marketing. Support to institutional capacity enhancement for quality control in fish feed development through strengthening knowledge and skills, as well as improving relevant facilities.
- Given the range of activities relating to introduction of new technology packages and the nature of the intended target communities, a participatory targeting strategy will be developed in order to avoid exclusion of certain groups from benefiting from project interventions.

2.1.4 Component 5 – Project Management and Coordination

The objectives of this component are: (i) to ensure that the project is carried out in line with the provisions in the Financing Agreement and relevant project documents, (ii) to act as a liaison between the Bank and the project, as well as between the project and the GoB, and (iii) to lead the implementation of selected overarching project activities.

The component will cover the following activities:

- fiduciary activities including coordination and monitoring of environmental and social safeguards compliance
- overall Project Monitoring and Impact Evaluation (M&IE) and reporting
- communication, public awareness and outreach
- technical reports and analytical studies for evidence-based policy decisions
- cross-sectoral activities, in particular developing/upgrading union-level Farmers Information and Advisory Centers
- strengthening research-extension linkages at various levels

- capacity building, skills development, mainstreaming climate change adaptation in agriculture
- comprehensive training program for technical staff

2.2 Sub-projects to be supported under the NATP Project

2.2.1 Agricultural Innovation Systems

The nature of sub-projects to be supported under the Component 1 are listed in Table 2-1.

Table 2-1: Sub-projects under the Component 1 of NATP-2

Specific Interventions	*Sub-projects*	*Major Negative Environmental Impacts*
Capacity Building – technical Assistance for institutional staff	Trainings, Doctoral studies	Nil
ICT for research - Development web-based platform that will also serve as a research database and knowledge center.	Creating web platform	Nil
Infrastructure Development – Renovation of equipment and laboratories	Infrastructure renovation support	Nil
Agricultural research (lab/ field based)	Lab-based and field-based research	Inputs and technologies to be used in the research activities may have negative impacts (e.g., contamination from biomedical waste from research laboratories)

2.2.2 Agriculture

The nature of sub-projects to be supported under the Component 2 are listed in Table 2-2.

Table 2-2: Sub-projects under the Component 2 of NATP-2

Specific Interventions	*Sub-projects*	*Potential Negative Environmental Impacts*
Enhancing skills of public extension workers	Trainings, Information material	Nil
Promotion of good agricultural practices developed under NATP-1	Extension on package of practices and inputs	Use of chemical fertilizers, pesticides leading to environment pollution
Integrated Pest Management and climate-smart technologies	Trainings, demonstrations	Use of any pesticides recommended under IPM without protective gear or in high dosages, just before harvest, open disposal of pesticide containers leads to health hazards and pollutes the surrounding environment
Promoting mechanization	Tractors, tillers, harvesters, etc.	High energy use and GHG emissions, safety issues involved in use of machinery
	Processing equipment	High energy use and GHG emissions, Health and safety issues
Infrastructure improvement for value chains, Agro-processing for the value chains selected	Construction of processing units Processing machinery	Impact on local resources – soil, water; Disposal of construction wastes Use of machinery demanding high energy use. Issues of safety in processing using machinery High use of energy, disposal of waste

Specific Interventions	*Sub-projects*	*Potential Negative Environmental Impacts*
	Cold storage units	
Aggregation of commodities	Market yards	Flocking of vehicles, noise and air and dust pollution due to transport
Capacity building to address women's needs	Trainings	Nil
Homestead gardening with Women groups	Kitchen gardens	Use of chemical inputs for gardens and non-local seeds
Establishment of seed testing laboratory	Seed testing machinery	Construction of laboratory and inappropriate location may have impacts

2.2.3 Livestock

The nature of sub-projects to be supported under the Component 3 are listed in Table 2-3.

Table 2-3: Sub-projects under the Component 3 of NATP-2

Sub-projects	*Potential Negative Environmental Impacts*
Research studies	• Nil
Training programmes for staff	• Nil
Extension activities: village camps, farm demonstrations, technical advisory services, ICT based extension	• Nil
Infrastructure development: Facility expansion at Central Cattle Breeding Farm, Savar; Equipment	• Construction related occupational health and safety impacts • Disposal of construction waste • Maintaining hygiene and sanitation
Modern management for dairy, sheep and buffalo farming (CIG/PO/SME activity)	• Land/vegetation degradation due to overgrazing. • Pollution from poor manure management. • Health risk (zoonotic diseases) from poor housekeeping and handling. • Promotion of only exotic breeds may lead to gradual extinction of indigenous breeds.
Introduction of sheep and buffalo rearing in low lying areas (CIG/PO/SME activity)	• Land/vegetation degradation due to overgrazing. • Pollution from poor manure management. • Health risk (zoonotic diseases) from poor housekeeping and handling. • Promotion of only exotic breeds may lead to gradual extinction of indigenous breeds.
Enhanced beef fattening using urea-molasses-straw mixes (CIG/PO/SME activity)	• Health risk from unauthorized use of anabolic steroids and feed additives.
Goat rearing using slat system for housing (CIG/PO/SME activity)	• Land/vegetation degradation due to overstocking. • Pollution from poor manure management. • Health risk (zoonotic diseases) from poor housekeeping and handling.
Production management for high yielding varieties of green fodder; Promotion of salinity tolerant fodder varieties in coastal areas (CIG/PO/SME activity)	• Pollution and health risk from improper selection and use of pesticides, over doses of fertilisers. • Groundwater depletion due to over-extraction of for irrigation. • Promotion of only exotic species/varieties may lead to gradual extinction of knowledge on native fodder species/varieties.
Silage and hay production (CIG/PO/SME activity)	• Health risk from poor housekeeping and handling. • Groundwater contamination due to leachate from

Sub-projects	*Potential Negative Environmental Impacts*
	silos.
Chaff cutters (CIG/PO/SME activity)	• Safety risk during operation.
Mini-feed compounding and mixing units (CIG/PO/SME activity)	• Health risk from unauthorized use of anabolic steroids and feed additives. • Health risk from poor housekeeping and handling.
Bio-gas production (CIG/PO/SME activity)	• Pollution and health risk from poor slurry management. • Groundwater contamination due to leachate from slurry pit.
Manure management in dung pits (CIG/PO/SME activity)	• Pollution and health risk from poor management. • Groundwater contamination due to leachate from pit.
Milking machines (CIG/PO/SME activity)	• Contamination of milk due to poor hygiene practices.
Milk collection (CIG/PO/SME activity)	• Contamination of milk due to poor hygiene practices.
Chilling plants for milk conservation (CIG/PO/SME activity)	• Contamination of milk due to poor hygiene practices. • Construction related occupational health and safety impacts • Disposal of construction waste • Maintaining hygiene and sanitation • Pollution due to improper disposal of waste water.
Milk pasteurization (CIG/PO/SME activity)	• Contamination of milk due to poor hygiene practices. • Pollution due to improper disposal of waste water.
Preparation of indigenous dairy products (CIG/PO/SME activity)	• Health risk from poor housekeeping and handling. • Health risk from use of unauthorized additives such as food colourants.
Improved small-scale slaughterhouses and dressing houses for safer meat production (CIG/PO/SME activity)	• Health risk (zoonotic diseases) from poor housekeeping and handling. • Contamination of meat due to poor hygiene practices. • Pollution due to improper disposal of solid and liquid wastes.
Input marketing (CIG/PO/SME activity)	• Increase in use of chemical inputs in agriculture. • Increase in use of hazardous chemical pesticides. • Risk of trading in banned or sub-standard chemical inputs. • Health risk from poor housekeeping and handling.
Commodity marketing (CIG/PO/SME activity)	• Health risk from poor housekeeping and handling.
Marketing facilities for sale of goats	• Health risk (zoonotic diseases) from poor housekeeping and handling.

2.2.4 Fisheries

The nature of sub-projects to be supported under the Component 4 are listed in Table 2-4.

Table 2-4: Sub-projects under the Component 4 of NATP-2

Specific Interventions	*Sub-projects*	*Potential Negative Environmental Impacts*
Promote productivity through an integrated approach	Specific fish production models	Water pollution due to use of pellet feed, chemicals etc.

Specific Interventions	*Sub-projects*	*Potential Negative Environmental Impacts*
		Loss of local fish diversity
	Quality fish seed	Pollution due to use of pellet feed, antibiotics, chemicals etc.
	Quality fish feed	Chemical residues in ingredients, unsafe storage etc.
	Application of fisheries management tools	Nil
Semi intensive fish production models to promote productivity and profitability	Genetically Improved Farm (GIF) Tilapia monoculture	Water pollution due to use of pellet feed, chemicals etc. Loss of local fish diversity
	GIF Tilapia polyculture	Water pollution due to use of pellet feed, chemicals etc. Loss of local fish diversity
	Pangas polyculture	Water pollution due to use of pellet feed, chemicals etc. Loss of local fish diversity
	Freshwater prawn polyculture	Water pollution due to use of pellet feed, chemicals, antibiotics etc. Loss of local fish diversity
	Koi polyculture	Water pollution due to use of pellet feed, chemicals etc. Loss of local fish diversity
	Carp polyculture	Water pollution due to use of pellet feed, chemicals etc. Loss of local fish diversity
Assured supply of quality fish seed	Fish seed of GIF tilapia	Water pollution due to use of pellet feed, chemicals etc. Loss of local fish diversity.
	Stock improvement of climbing perch and Thai pangas	Water pollution due to use of pellet feed, chemicals etc. Loss of local fish diversity
Formulated fish feed with local ingredients	Fish feed preparation units	Chemical residues in ingredients affecting feed quality, dust emissions during preparation, unsafe storage leading to pest, mold infestation, etc.
Promotion of climate resilient innovative technologies	Use of short seasonal water bodies	Loss of fish diversity due to introduction of new species, water pollution due to feed application in excess quantities
	Tolerant species in saline areas	Loss of fish diversity due to introduction of new species, water pollution due to feed application in excess quantities
	Innovations like cage fish culture, pen farming in open water	Spread of diseases
Increasing local extension agents	Recruitment, training programmes	Nil
Promoting farmer to farmer extension	Training programmes	Nil
Strengthening research extension linkage	Outreach programmes	Nil
Investment in development and enhancement of value chains	Improvement and management of fish marketing infrastructure	• Local resource use during construction – water, soil etc. • Loss of vegetation. • Disposal of construction waste etc. • Pollution in the surroundings due to disposal of fish waste, drainage problems due to water,

Specific Interventions	*Sub-projects*	*Potential Negative Environmental Impacts*
		bad odour etc. • Construction related occupational health and safety impacts • Disposal of construction waste • Maintaining hygiene and sanitation
	Preservation of fish	Use of chemicals like formaldehyde for preserving wet fish, use of pesticides for storage of dry, salted fish
	Setting up cold storage structures	Issues during construction – local resource use, waste disposal etc. • High energy requirement for running cold storage, waste water and waste disposal • Construction related occupational health and safety impacts • Disposal of construction waste Maintaining hygiene and sanitation
	Setting up small ice plants	Local resource use and pollution during construction – disposal of debris, loss of vegetation soil etc. Use of low quality water for making ice spoiling the fish, open disposal of ice contaminated with fish slime leading to health issues. High energy requirement for running the plants.
	Food safety and feed quality	Use of harmful chemicals, toxic dyes in preservation of fish. Practice of not washing fish at different stages leading to bacterial growth. Disposal of waste water.
Institutional capacity enhancement for quality control	Training programmes	Nil

3 Legal and Regulatory Framework

This section describes relevant national environmental management requirements as well as the World Bank's Safeguards Policies applicable to the NATP-2 Project and its sub-projects. In each case, national and local institutions that will be involved in reviewing and approving sub-projects should be identified, along with their respective roles and responsibilities. Responsibilities may include issuing approvals for undertaking a subproject and ensuring compliance to obligatory requirements under laws and regulations.

3.1 Relevant Government Acts and Rules in Bangladesh

The compliance requirements as per the legal and regulatory framework in the country are provided in the Table 3-1.

Table 3-1: Environmental Issues and Relevant Laws and Regulations in Bangladesh

Issues	*Laws/Regulations*	*Enforcing Agency*	*Regulated/Enforced Items*
Water pollution	Environment Conservation Act, 1995 Environment Conservation Rules, 1997 Environmental Court Act, 2000	MOEF/DOE	Promulgation of standards for water quality. Promulgation of discharge limits.
	Water Supply and Sanitation Act, 1996 The Local Government Ordinance, 1983 National Policy for Arsenic Mitigation 2004	MOLGRDC/ DPHE UPs	Prosecution of offenders. Management of water supply and sanitation in rural areas. Control of Environmental sanitation in rural areas.
Toxic or hazardous waste pollution Solid waste pollution	Environment Conservation Act, 1995 Environment Conservation Rules, 1997 Industrial Policy, 1999	MOEF/DOE MOI	Promulgation of standards and management rules.
Pollution of fisheries	The Protection and Conservation of Fish Act, 1950 National Fisheries Policy, 1996	MOFL	Promulgation of regulatory measures.
Pollution from animal production	Bangladesh Animal Disease Act, 2005 Bangladesh Animal and Animal Product Quarantine Act, 2005	MOFL	
Pesticides and fertilizers	The Agricultural Pesticides Ordinance, 1971 National Agricultural Extension Policy, 1996 National Agricultural Policy, 1999	DAE	Approval of permissible pesticides.

Issues	*Laws/Regulations*	*Enforcing Agency*	*Regulated/Enforced Items*
Forest conservation	Environment Conservation Act, 1995 Environment Conservation Rules, 1997 The Forest Act 1927 National Forestry Policy, 1994	MOEF/BFD MOEF/BFD	Declaration of ecologically critical areas. Reserve forest, protected forest, village forest.
Wildlife conservation and national parks	Environment Conservation Act, 1995 Environment Conservation Rules, 1997 The Wild Life (Preservation) (Amendment) Act, 1974	MOEF/DOE	Declaration of ecologically critical areas.
Food Safety	Food Safety Act 2013 Animal Slaughter and Meat Control Act 1957 Bangladesh Animal Feed Act, 2002	MoFL	Safety standards for food products including milk products and meat and animal feed.
Introduction of exotic species	Destructive Insects and Pest Rules, 1966 Bangladesh Animal and Animal Product Quarantine Act, 2005 Plant Quarantine Act, 2011	MoA	Quarantine regulations for controlling indiscriminate introductions of animal and plant species.

3.1.1 Environmental Guidelines for Industries/Enterprises in Bangladesh

Depending on the extent of impact on the environment, projects are classified in four different categories under the ECR 1997. The four categories are: Green, Orange A, Orange B and Red. The procedures for obtaining 'Location Clearance (LC)' and 'Environmental Clearance (EC)' for different categories of projects are also provided in the ECR. For all categories, schedules containing lists of industries and projects are provided in the ECR. Green category industries are to be granted EC within 15 days. For Orange A & B and Red category of industries and projects, an application for EC must include a 'Feasibility Report (FR)' and an 'Initial Environmental Examination (IEE)' report. A Process Flow Diagram and a Layout Plan are also needed for industries. IEE report must include a 'Terms of Reference' for the Environmental Impact Assessment (EIA) for Red Category industries and projects. An EIA report is mandatory for final approval and issuing of an 'Environmental Clearance' for Red Category industries and projects. The ECR, 1997 lists the contents required for both IEE and EIA reports. The ECR environmental categories for Projects and Industries are listed in Table 3-2.

Table 3-2: ECR Environmental Categories for Projects and Industries in Bangladesh

Category	*List of activities specified in ECR 1997*	*Industries/Enterprises of direct relevance to NATP*	*DoE Clearance Requirements*	*WB Category*
Green	None relevant to NATP	None	Environmental Clearance Certificate based on application to DEA containing general information about industrial unit/project, exact description of raw materials and product and no objection from local authority.	C (likely to have minimal or no adverse environmental impacts)
Orange A	Dairy Farm, 10 cattle heads or below in urban areas and 25 cattle heads or below in rural areas; Poultry (up to 250 in urban areas and up to 1000 in rural areas); Grinding/husking of wheat, rice, turmeric, pepper, pulses (up to 20 hp)	Small-scale Dairy Farms Small-scale Poultry Farms Small-scale agro-processing units	Locational Clearance (LC) Certificate and Environmental Clearance (EC) Certificate based on application to DoE containing general information about industrial unit/project, exact description of raw materials and product and no objection from local authority, process flow diagram, layout pan, effluent discharge arrangement, etc.	B (potential, adverse environmental impacts are less adverse than those of Category A projects, impacts are site-specific, few are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects)
Orange B	Processing fish, meat, food; Animal feed; Processing of prawns and shrimps; Automatic rice mill; Production of powder milk/condensed milk/dairy; Cold storage; Cattle farm above 10 numbers in urban areas and above 25 numbers in rural area; Poultry above 250 in urban area and above 1000 in rural area;	Fish, meat, food processing units Animal feed manufacturing units Processing units for prawns and shrimp Production units for powder milk, condensed milk, dairy Cold storage units. Medium to large scale cattle farms Medium to large scale poultry farms Dairy and food manufacturing units	Locational Clearance (LC) Certificate and Environmental Clearance (EC) Certificate based on application to DEA containing Feasibility Report, Initial Environmental Examination (IEE) Report, Environmental Management Plan (EMP) Report, no objection certificate from local authority, emergency plan, etc.	

Category	*List of activities specified in ECR 1997*	*Industries/Enterprises of direct relevance to NATP*	*DoE Clearance Requirements*	*WB Category*
	Grinding, husking wheat, rice, turmeric, chilly, pulses – machine over 20 hp; Dairy and food			
Red	None relevant to NATP	None	IEE, Feasibility Report, EIA	A (likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented)

3.2 Relevant International Obligations

The international environmental conventions, treaties and protocols to which Bangladesh is a party should be taken into account in the implementation of the NATP-2 sub-projects where ever applicable. These International agreements of Bangladesh are summarized below:

- International Plant Protection Convention, Rome, 1951 (Ratified 1978).
- Convention on Wetlands of International Importance, especially as Waterfowl Habitat, Ramsar, 1971 (Ramsar Convention) (Ratified 1992).
- Convention Concerning the Protection of the World Cultural and Natural Heritage, Paris, 1972 (World Heritage Convention) (Ratified 1983).
- Convention on International Trade in Endangered Species of Wild Fauna and Flora, Washington, 1973 (CITES Convention) (Ratified 1982).
- Agreement on the Network of Aquaculture Centers in Asia and Pacific (NACA), 1988.
- Montreal Protocol on Substances that Deplete the Ozone Layer, Montreal, 1987 (Ratified 1990), (London Amendment, 1990) (Ratified 1994).
- Convention on Biological Diversity, Rio de Janeiro, 1992 (Ratified 1994).
- International Convention to Combat Desertification, 1994.
- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, Basel, 1989 (Ratified 1993).
- United Nations Framework Convention on Climate Change, New York, 1992 (Ratified, 1994).

The Ramsar Convention has probably the most relevance to the NATP-2 Project, as apart from protection of internationally important wetlands (Ramsar Sites[1]), signatories of the convention are bound to adhere to the 'wise use of wetlands'. The sub-projects should be screened to avoid any draining and conversion of wetlands, using these for dumping solid waste, polluting them with agro-chemicals or sewage, blocking of streams and rivers, etc.

3.3 World Bank Safeguard Policies

The World Bank has several policies governing environmental assessment (EA) of projects. Two of the Bank's environmental safeguard policies are relevant to the NATP-2 project. These are the OP 4.01 on Environmental Assessment and OP 4.09 on Pest Management.

3.3.1 Environmental Assessment (OP 4.01)

The Bank requires Environmental Assessment (EA) of projects proposed for Bank financing to help ensure that they are environmentally sound and sustainable, and thus to improve decision making. EA is a process whose breadth, depth and type of analysis depend on the nature, scale and potential environmental impact of the proposed project. EA examines project alternatives, identifies ways of improving project selection, siting, planning, design, and implementation by preventing, minimizing, mitigating or compensating for adverse environmental impacts and enhancing positive impacts; and includes the process of mitigating and managing adverse environmental impacts throughout project implementation.

[1] Bangladesh has two designated Ramsar Sites, namely part of the Sunderbans mangrove forest and Tangoar Haor. The NATP-AF Project area does not contain any Ramsar sites, however some project areas in the Barisal division are adjacent to Sundarbans.

The Bank classifies the proposed project into three categories depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts. The categories, in brief, are:

- **Category A**: A proposed project is classified as Category A if it is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works. EA for a Category A project examines the project's potential negative and positive environmental impacts, compares them with those of feasible alternatives, and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance. For a Category A project, the borrower is responsible for preparing an EIA.
- **Category B**: A proposed project is classified as Category B if its potential adverse environmental impacts on human populations or environmentally important areas--including wetlands, forests, grasslands, and other natural habitats – are less adverse than those of Category A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases mitigatory measures can be designed more readily than for Category A projects. The scope of EA for a Category B project may vary from project to project, but it is narrower than that of Category A EA. Like Category A EA, it examines the project's potential negative and positive environmental impacts and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance.
- **Category C**: A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental impacts. Beyond screening, no further EA action is required for a Category C project.

The NATP-2 has been classified as a Category B project by the World Bank. In tune with the requirements of the OP 4.01, this Environmental Management Framework has been prepared for the NATP-2.

3.3.2 Pest Management (OP 4.09)

The Bank supports a strategy that promotes the use of biological or environmental control methods and reduces reliance on synthetic chemical pesticides. In Bank-financed agriculture operations, pest populations are normally controlled through IPM approaches, such as biological control, cultural practices, and the development and use of crop varieties that are resistant or tolerant to the pest.

The procurement of any pesticide in a Bank-financed project is contingent on an assessment of the nature and degree of associated risks, taking into account the proposed use and the intended users. With respect to the classification of pesticides and their specific formulations, the Bank refers to the World Health Organization's *Recommended Classification of Pesticides by Hazard and Guidelines to Classification*. The following criteria apply to the selection and use of pesticides in Bank-financed projects:

(a) They must have negligible adverse human health effects.

(b) They must be shown to be effective against the target species.

(c) They must have minimal effect on non-target species and the natural environment. The methods, timing, and frequency of pesticide application are aimed to minimize damage to natural enemies.

(d) Their use must take into account the need to prevent the development of resistance in pests.

The Bank requires that any pesticides it finances be manufactured, packaged, labeled, handled, stored, disposed of, and applied according to standards acceptable to the Bank. The Bank does not finance formulated products that fall in WHO classes IA and IB, or formulations of products in Class II, if (a) the country lacks restrictions on their distribution and use; or (b) they are likely to be used by, or be accessible to, lay personnel, farmers, or others without training, equipment, and facilities to handle, store, and apply these products properly.

In tune with the requirements of the OP 4.09, a Pest Management Plan (PMP) has been prepared for the NATP-2 (it is available as a separate document).

3.4 Implications of the Legal and Regulatory Framework on NATP-2 Project Interventions

The relevant legal and regulatory requirements have been incorporated as required into the Environment Management Process. Specifically, the following arrangements have been incorporated:

3.4.1 List of Negative Attributes and/or Sub-projects

A negative list of attributes, sub-projects or activities that will not be supported under the NATP-2 has been agreed upon. This list includes the following sub-projects:

- Activities that are not in compliance with the laws and regulations of the Government of Bangladesh (including Environment Conservation Rules 1997, Food Safety Act 2013, Animal Slaughter and Meat Control Act 1957).
- Activities that involve pesticides that fall in WHO classes IA, IB and II and pesticides banned by the Government of Bangladesh.
- Activities involving significant conversion or degradation of critical natural habitats (mangroves, wetlands, etc.).
- Activities within Protected Areas (Wildlife Sanctuaries and National Parks).
- Activities that involve significant conversion or degradation of cultural property resources.
- Activities that involve Genetically Modified Organisms (GMOs) that have not been approved by an independent panel of internationally recognized experts, and cleared by the World Bank and the Government of Bangladesh.

3.4.2 Environmental Assessment

The NATP-2 activities involving financing of CIGs, POs, SMEs will go through environmental screening and assessment. The procedure identified for the environmental screening and assessment is in alignment with that prescribed in the ECR, 1997 of the Government of Bangladesh.

Table 3-3: Environmental Categories and Assessment Requirements for Sub-projects in NATP-2

Category	*DoE Clearance Requirements*	*Corresponding WB Category*	*NATP-2 Environmental Management Process*
Green	Environmental Clearance Certificate based on application to DEA containing general information about industrial unit/project, exact description of raw materials and product	C	Categorically excluded from environmental assessment

Category	*DoE Clearance Requirements*	*Corresponding WB Category*	*NATP-2 Environmental Management Process*
	and no objection from local authority.		
Orange A	Location Clearance Certificate and Environmental Clearance Certificate based on application to DoE containing general information about industrial unit/project, exact description of raw materials and product and no objection from local authority, process flow diagram, layout pan, effluent discharge arrangement, etc.	B (partial assessment)	Environmental Screening; Limited Environmental Assessment; Environmental Management Plan
Orange B	Location Clearance Certificate and Environmental Clearance Certificate based on application to DEA containing Feasibility Report, Initial Environmental Examination (IEE) Report, Environmental Management Plan (EMP) Report, no objection certificate from local authority, emergency plan, etc.		Environmental Screening; Detailed Environmental Assessment; Environmental Management Plan

4 Environmental Baseline of the Project Area

The sub-projects proposed to be supported under the NATP involve use of natural resources (soil, water, biodiversity) and may have an impact on these natural resources and on the surrounding environment through over exploitation and waste generation. An environmental situational analysis was carried out as part of the EMF to understand the status of the natural resources necessary for sustaining the interventions in the key sectors – Agriculture, Livestock and Fisheries. The key environmental issues in each sector are highlighted. The climate change impacts and adaptation needs specific to the three sectors have also been highlighted.

4.1 Agriculture – Status and Key Environmental Issues

4.1.1 Brief Overview of the Agriculture Sector

About 80 percent of the total population of Bangladesh lives in rural areas, and 62 percent of them are directly engaged in a wide range of agricultural activities. The agricultural sector contributes around 29 percent of the country's Gross Domestic Product (GDP) and generates employment for 63 percent of the total labor force[2]. The common crops grown are rice, wheat, jute, cotton, sugarcane, vegetables, tea etc. According to the World Bank, the total arable land in Bangladesh is 61.2 percent of the total land area (68.3 percent in 1980). Farms are usually very small. Staple crops are rice and wheat the yields of which are fluctuating due to weather. The 3 main crops—rice, jute, and tea—have dominated agricultural exports for decades, Jute, often called the "golden fibre" of Bengal, is the main export-earner for Bangladeshi agriculture, as Bangladesh remains the world's second-largest producer of jute (after India) and the world's largest exporter of fiber[3].

The climate is humid tropical monsoon type of climate, warm and humid in the summer, dry and moderate cool in the winter with three meteorological seasons - summer, monsoon and winter. The hyper - thermic temperature regime makes agricultural production possible throughout the year. The annual rainfall ranges from 1500 mm in the northwestern part to 5000 mm in the northeast. It is the rainfall along with depth and duration of flooding that remains the critical factor for agriculture in the country.

About 80 percent of Bangladesh territory can be defined as wetlands according to the Ramsar convention (Ullah, 2002). These include the entire floodplain areas. The fertile soils on the few vast floodplains are annually replenished by siltation during the flood. There are many freshwater wetlands in the floodplain areas, which include haors, baors, beels and jheels, where 200-300 wetland plant species are found. Cropping intensity, which may be an indicator of land use intensity, is gradually increasing and stood at 176 percent in 1996-97 (BBS, 1999)[4]. Annex 1 briefly describes Agro-ecological zones of Bangladesh.

[2] http://www.bangladesh.gov.bd/?q=en/agriculture-bangladesh, viewed on 13th October 2014
[3] http://www.nationsencyclopedia.com/economies/Asia-and-the-Pacific/Bangladesh-AGRICULTURE.html accessed on 13th October 2014.
[4] *Agricultural Land use, and Land Susceptibility in Bangladesh: An Overview*
http://globalcommunitywebnet.com/GlobalFiles/agriculturallanduse.pdf

4.1.2 Water Resources

Most of Bangladesh is located within the flood plains of the three great rivers: the Ganges, the Brahmaputra and the Meghna, and their tributaries, such as Teesta, Dharla, Dudkumar, Surma and Kushiyara. The three major river systems drain to the Bay of Bengal through Bangladesh.

Besides surface water, ground water is the other major source of water in Bangladesh for agricultural purpose. Ground water plays a very vital role during the dry season and drought periods. Ground water levels are highest from August through October and lowest in April and May. Irrigation water has been decreasing during the last few years due to siltation of natural water sources like canals, khals, etc. These need re-excavation. Water is lost due to inefficient conveyance mechanisms.

4.1.2.1 Stress on Water Resources

Groundwater is a vital natural resource for the reliable and economic provision of irrigation water and potable water supply in both the urban and rural environments. It thus plays a fundamental role in human well-being. Ground waters from both shallow and deeper aquifers are being used extensively for irrigation. However, aquifer depletion and salinity are already issues of concern. It is necessary to exercise caution in the large scale exploitation of confined deep aquifers, as these may be depleted giving rise to serious problems in the future. Therefore, activities that encourage groundwater recharge need to be integrated into the design of irrigation systems.

4.1.2.2 Occurrence of Drought

Lately, it is recognized that the damage inflicted by droughts upon crop production is greater than the damage inflicted by floods. Few districts included in the NATP-2 Project are inflicted with seasonal drought. Dearth of drought tolerant varieties as well as a lack of water management leads to substantial loss of crops in every year.

4.1.2.3 Arsenic contamination

Arsenic contamination of ground water is a serious issue of concern in the country. The source is parent rock and several tube well irrigated crops receive the contaminated water. For long, the arsenic bearing minerals such as arsenic sulfides were submerged in groundwater and remained inert. With the start of intensive withdrawal of groundwater for irrigation for growing Boro rice, the aquifers started to drop causing arsenic to oxidize. Once oxidized, arsenic sulfides become water-soluble which ultimately come up with the pumped water. Out of 64 districts in Bangladesh, water of 61 districts have arsenic in their ground water where more than 65% of the country's population live (Chowdhury, 2000).

4.1.3 Nutrient and Pest Management

4.1.3.1 Nutrient management

The organic matter content and fertility status of Bangladesh soil is very low. Cultivation of High Yielding Varieties of crops and adoption of modern technologies have led to severe depletion of nutrients from the soil. Good agricultural soil should contain at least 2% organic matter, mostly in the top 20-25 cm layer of the soil. But in Bangladesh, most of the cultivated soils have less than 1.5%, while some have less than 1% organic matter. Depletion of the same type of nutrient

from the same layer of soil for years together by mono-cropping with rice has also contributed to nutrient mining and soil degradation. Presently the organic matter content of the main agricultural lands is reported to be declining and nutrient balances are negative for the main nutrients, especially N and K. Micro-nutrient deficiencies are increasing. Generally, farmers use imbalanced chemical fertilizers for individual crop without considering cropping pattern for the whole year. Intensive agriculture with very high nutrient turnover in soil-plant system coupled with low and imbalanced fertilizer use have resulted in deterioration of native soil fertility and created a serious threat to long-term sustainability of crop production (Anonymous, 2009). It is well agreed that depleted soil fertility is the major constraint to higher crop production in Bangladesh and indeed, the yield of several crops are declining in some soils (Bhuian, 1991)[5]. During about the last 15 years, 63-73% of the total fertilizers applied in the field comprised Urea (containing nitrogen) and only 18-20% and 5-15% fertilizers comprised TSP and MP, respectively (BBS). This imbalance in fertilizer use has further aggravated the soil fertility situation.

4.1.3.2 Pest management

Pest infestation is a serious concern in Bangladesh and pesticide use has increased manifold from 758 metric tons in 1960 and 3028 metric tons in 1980 to over 19000 metric tons in 2000 and in 2008, the amount of pesticide applied in fields across the country rose to 48690 metric tons. Insecticides, being the dominant item, account for 76% of the pesticides applied. It has been reported that 20 insecticides, 18 fungicides and 2 rodenticides, are being used in Bangladesh. The major pesticides used by the farmers are Cypermethrin, Dichlorvos, Malathion, Carbofuran, Mancozeb and Diazinon depending upon the pests. Besides, many pesticides used in Bangladesh are in the banned or restricted list under international agreements.

Most farmers apply pesticide without knowing its actual requirements and/or effectiveness, and thus there are very high frequencies of pesticides application, for example, 150 sprays in a crop season in brinjal is noticed. More than 90% farmers of Bangladesh use pesticide unnecessarily, indiscriminately and excessively due to their ignorance and unconsciousness about the use[6]. Besides 90% of them do not take any precautions during mixing or application of pesticides[7].

4.1.4 Agricultural Biodiversity

Bangladesh is divided into 12 broad bio-ecological zones. The ecosystems of Bangladesh can be placed under 4 broad types viz., coastal and marine ecosystem, inland freshwater ecosystem, terrestrial forest ecosystem and man-made ecosystem (Daniels, 2003). There are 18 Protected Areas in Bangladesh, covering 2400km2 and representing 1.63% of the country's surface area In Bangladesh, threats to biodiversity arise from loss of habitat due largely to deforestation and inappropriate water and agricultural management, over-harvesting of resources, efforts to increase agricultural productivity, and natural disasters. The National Biodiversity Strategy and Action Plan (NBSAP) of Bangladesh provides a framework for conservation, sustainable use and

[5] *Integrated Nutrient Management for Sustaining Soil Fertility Through Chickpea-Mungbean-T.Aman Cropping Pattern at Madaripur Region*. Viewed at http://www.banglajol.info/index.php/BJAR/article/viewFile/11226/8203 on 13th October 2014

[6] *Unsafe use of pesticides and its impact on health of farmers – A case study in Burichong Upazila Bangladesh*. Viewed at http://iosrjournals.org/iosr-jestft/papers/vol8-issue1/Version-5/J08155767.pdf on 13th October 2014.

[7] http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/SOUTHASIAEXT/0,,contentMDK:21178423~pagePK:2865106~piPK:2865128~theSitePK:223547,00.html

sharing the benefits of biodiversity of the country. The invasive alien species include *Eichhornia crassipes* (Kachuri pana) a notorious weed of fresh water ecosystems; *Eupatorium odoratum* (Ayapan) and *Mikania cordata* (Assam lota) are two invaders of terrestrial ecosystems that overtop the canopy of shrubs and young tree saplings. *Croton bonplandianum* (Bon khira) and *Lantana camara* (Nak phul) grow along the edges of forest and waste lands and invade local vegetation[8].

4.1.5 Post-Harvest Losses and Processing

The post- harvest losses for crops are huge ranging from 13.5 percent for grain to 40 percent for fruits and vegetables. The losses occur during the operation of handling, transportation, milling, drying, parboiling, harvesting, field stacking, threshing, and storage. About 75% of the tuber crops are stored at home and remaining 25% are stored in the cold storage. Scientific drying is absent in Bangladesh. Storage facilities for cereals in the public sector are meager. Out of 4-5 million tons of horticultural produce only 0.5% of the horticultural production is processed. Food processing is grouped as home based food processing, intermediate and industrial processing. In Bangladesh, jam, jelly and pasted products comprise the largest share (22.4%) of production within fruits and vegetable industry, followed by fruits juice and squash (16.5%) and fruit pickle (12.3%)[9]. Research and development agenda of the food processing include solar and natural gas dryer, non-refrigerated cooler for fruits and vegetables, storage structure for different crops, dehydrated product formulation, formulation of fruit leather, etc.

4.1.6 Food Safety

Problems with food safety are diverse in Bangladesh. Safety has become an important topic in Bangladesh as consumers of the country have become victim due to serious adulteration in food. The Bangladesh Pure Food Ordinance, 1959 is to provide better control of the manufacture and sale of food for human consumption. The Bangladesh Pure Food Rules, 1967 has generic standards for 107 food products[10]. The key concerns in food processing are the chemical residues of pesticides, contaminants like arsenic through water and use of artificial ripening agents etc.

4.1.7 Farm Mechanization

Use of farm machinery has increased in Bangladesh over past two decades. Irrigation is mechanized by 1.5 million diesel pumps bringing 61% of cultivable land under irrigation. About 80% of land preparation is done by power tillers and tractors. Power operated threshers are being used in paddy and wheat to 80%[11].

4.1.8 Key Environmental Issues in Agriculture Sector

- Crop failures due to natural calamities like floods and droughts due to geographical settings and manmade activities.
- Water erosion near the older formations the hills and terraces.

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[8] NBSAP – viewed at http://www.indiaenvironmentportal.org.in/files/file/NBSAP%20bangladesh.pdf on 14th October 2014.

[9] *Post harvest technology for Employment Generation in Rural Bangladesh*. Viewed at http://unapcaem.org/Activities%20Files/A20/3%20Bangladesh.pdf on 13th October 2014.

[10] *Food safety regulation in Bangladesh, chemical hazard and some perception to overcome dilemma*. Viewed at http://www.ifrj.upm.edu.my/20%20(01)%202013/7%20IFRJ%2020%20(01)%202013%20Islam%20(356).pdf on 14th October 2014.

[11] *Status of Agriculture Mechanization in Bangladesh*. Viewed at http://www.unapcaem.org/Activities%20Files/A1112Rt/bd.pdf on 13th October 2014.

- Soil salinity is due to tidal flooding during wet season (June-October), direct inundation by saline water and upward on lateral movement of saline ground water during the dry season.
- Water logging due to rise in ground water lowering the land productivity. Water logging by natural means or may be due to faulty irrigation management.
- Severe forms of acidification in the soils of the hills, terraces and some floodplains and in the heavy clays in the Sylhet and lower Atrai basins and in some broad valleys within the Madhupur and the Barind tracts.
- Aluminum toxicity and phosphate fixation the major are problems in the tea growing soils. Active acid sulfate soils occupy about 62,000 ha in the eastern coastal area and potential acid sulfate soils are reported to occupy some 8,000 ha in the adjoining tidal lands.
- Formation of hard pan in rice soils is also common.
- Soil pollution due to fertilizers, insecticides and pesticides and industrial discharges.[12]
- Arsenic contamination: Using arsenic polluted water for irrigation potentially is risky, as this poisonous element will ultimately enter the food chain.
- Indiscriminate use of pesticides without safety precautions by large percentage of farmers leading soil pollution, contamination of water bodies, biodiversity and posing health risks
- High rate of mineralization of organic carbon and depletion of nutrients encouraging use of chemical fertilizers.

4.2 Livestock – Status and Key Environmental Issues

4.2.1 Brief Overview of the Livestock Sector

The livestock sector contributes to 3% of Bangladesh's Gross Domestic Product (GDP) and 12% of its agricultural GDP13. It provides 15 percent of the total employment in the economy[14].

The livestock population in Bangladesh comprises of cattle (24.68 m), buffaloes (0.64 m), goats (25.21 m) and sheep (3.12 m) contributing to an annual milk production of 2.89 million ton and meat production of 1.17 million ton[15].

The majority of poor rural households raise livestock which provide power for cropping, transport, threshing, and oilseed crushing; manure as a source of fertilizer and fuel; a ready source of cash; and meat, milk, and eggs for human consumption[16]. On an average, smallholders keep 1.9 animals per farm (with a range of 1 to 8 heads) and seasonal producers keep 2.3 animals

[12] The state has more than 30,000 industrial units, large and small. These are discharging their wastes and effluents in the natural systems in most cases without any treatment and thereby cause environmental pollution especially due to heavy metals and organic toxins. The toxic heavy metals discharged from industries in Bangladesh are cadmium, lead, chromium, mercury, zinc, arsenic and in few cases copper and manganese. The industries like tannery, paper and pulps, textiles, carbides, pharmaceuticals, pesticides, distilleries etc, discharge heavy metals with their effluents and wastes.

[13] Karim, et al. 2010. *Growth and Development Potential of Livestock and Fisheries in Bangladesh*.

[14] Ministry of Fisheries and Livestock, Government of Bangladesh. *National Livestock Development Policy 2007*.

[15] Uddin, 2013. *Animal Feed Resources and their Management in Bangladesh*. FAO-APHCA workshop, 13-15 August 2013.

[16] FAO, 2005. *Livestock Sector Brief – Bangladesh*.

per farm (with a range of 2 to 22 heads)[17]. Most cattle are raised under an extensive or mixed crop-livestock production system with only 6% being raised under an intensive production system. Similarly only 15% of goats and 2% of sheep are raised under an intensive production system[18].

Around 3.5 million cattle and 15 million goats are slaughtered annually in the country. There are an estimated 192 improvised slaughter houses at district level, 1215 at Upazila level and more than 3000 slaughtering points in hats and bazars as well as by roadsides of cities and towns.

4.2.2 Key Environmental Issues

The key environmental issues associated with the livestock sector in Bangladesh are outlined below.

4.2.2.1 Scarcity of Fodder

Bangladesh has one of the highest cattle densities at 145 large ruminants per sq.km[19]. The availability of roughage is 26.27 million ton as against the requirement of 37.45 million ton (a deficit of about 30%). The availability of concentrate is 5.83 million ton as against the requirement of 46.4 million ton (a deficit of about 88%)[20]. The acute shortage of feeds and fodder is one of the single most important obstacle to livestock development in the country. The main constraints for feed management are: shortage of feeds and fodder, scarcity of land for fodder production, seasonal fluctuations in supply of feeds and fodder, low quality feed, high feed prices and poor husbandry practices[21].

4.2.2.2 Under-utilization of Dung

Cattle dung is an important link between crop and animal production in Bangladesh. It is estimated that only about 20-40% of the dung is composted while 5% is directly applied to crops. Also, 25-30% of dung is directly used a fuel with only about 15% of manure – especially from large farms being used for biogas production. Another 10-50% is sold for use as fuel or manure[22].

4.2.2.3 Loss of Biodiversity

Breed improvement interventions focus mostly on exotic varieties which are not all well adapted to Bangladesh's climatic conditions. There are a number of promising well-adapted native livestock breeds in the country (e.g., Red Chittagong cattle, Black Bengal goat, Bengal sheep, etc.), which could be developed into high yielding breeds through cross breeding in a systematic manner. Import of inappropriate genetic material couples with indiscriminate crossbreeding and clear neglect of indigenous breeds has created a situation, where a number of native breeds of livestock are under threat of extinction[23].

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[17] Karim, et al. 2010. *Growth and Development Potential of Livestock and Fisheries in Bangladesh*.
[18] Uddin, 2013. *Animal Feed Resources and their Management in Bangladesh*. FAO-APHCA workshop, 13-15 August 2013.
[19] Ministry of Fisheries and Livestock, Government of Bangladesh. *National Livestock Development Policy 2007*.
[20] Uddin, 2013. *Animal Feed Resources and their Management in Bangladesh*. FAO-APHCA workshop, 13-15 August 2013.
[21] Ministry of Fisheries and Livestock, Government of Bangladesh. *National Livestock Development Policy 2007*.
[22] Sarker, 2013. *Present Status Livestock & Manure Management of Bangladesh*. Start-up meeting on CCAC Agriculture Initiative's Livestock and Manure Management Component.
[23] Ministry of Fisheries and Livestock, Government of Bangladesh. *National Livestock Development Policy 2007*.

4.2.2.4 Public Health Risk

The use of anabolic steroids for cattle fattening is common in Bangladesh (about 58% farmers reported their use for cattle fattening for 3-6 months)[24]. No registration is required for feed additives such as toxins binder, antibiotics, and vitamin-mineral premixes, animal protein – many of which are potentially harmful to human health. Most of the drug traders and shop keepers have no formal training on drug handling, transportation, storing and dispensing and readily sell drugs such as anti-biotics, hormones and sedatives across the counter without prescription. The laboratories of the Department of Livestock Services have no provision for residue analysis of drugs, heavy metals, hormones, pesticides and toxins in foods of animal origin[25].

4.2.2.5 Air Pollution from Poultry and Dairy Farms

Large scale poultry farms built in residential areas can pollute the environment, particularly with offensive odours, and render them unfit for human habitation. The same is true for dairy farms set up in residential area. However, the farms targeted for NATP-2 are small-scale ones and so do not present such difficult environmental problems.

4.2.2.6 Poor Hygiene and Pollution

Most slaughtering takes place with inadequate facilities for electricity, water and waste disposal. In most slaughter houses, meat is handled under unsatisfactory sanitary conditions. Enforcement of legislation relating to slaughtering and meat inspection is weak. Besides hides and skins, the slaughtering of animals generates potentially valuable by-products including blood, bones, hoofs, rumen and visceral contents, hair, etc. Only a few of these by-products, generated mainly in organized slaughter houses, are collected and processed by cottage level industries. Most of the by-products are discarded inappropriately resulting in pollution as well as economic loss[26].

Disaster Management: Bangladesh is prone to natural disasters (heavy rainfall, floods, drought, cyclone, tidal surges, etc.). Livestock population is significantly affected in a disaster situation as availability of drinking water and fodder become difficult and there is a high risk of epidemics.

4.3 Fisheries – Status and Key Environmental Issues

4.3.1 Brief overview of Fisheries Sector[27]

Fish play a crucial role in the Bangladeshi diet, providing more than 60% of animal source food. Fish (including shrimp and prawn) is the second most valuable agricultural crop, and its production contributes to the livelihoods and employment of millions. According to the statistics of Official Department of Fisheries (DOF) total fish production is 2.56 million tonnes, of which aquaculture accounts for 39%.

Fisheries resources in Bangladesh are extensive and diverse.

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[24] Islam, 2012. *Present status on the use of anabolic steroids and feed additives in small scale cattle fattening in Bangladesh*. Progress. Agric. 23 (1&2): 1-13, 2012.
[25] Ministry of Fisheries and Livestock, Government of Bangladesh. *National Livestock Development Policy 2007*.
[26] Ministry of Fisheries and Livestock, Government of Bangladesh. *National Livestock Development Policy 2007*.
[27] *Review of aquaculture and fish consumption in Bangladesh*. Viewed at http://www.worldfishcenter.org/resource_centre/WF_2970.pdf on 13th October 2014.

- Inland pond culture: inland pond culture represents the mainstay of aquaculture in Bangladesh, accounting for almost 86% of total recorded aquaculture production, dominated by carps followed by tilapia and pangasius catfish. 4.27 million households (20% of rural inhabitants) operate a homestead pond, covering a combined area of 265,000 ha.
- Commercial semi-intensive carp culture: this covers an area of 110,000 ha, and intensive forms of entrepreneurial pond culture cover just 15,000 ha. Management is generally intensive, utilizing pelleted feeds, and yields per hectare are high (typically in the order of 40 t/ha for pangasius, and 10 t/ha for tilapia per year), which is otherwise less than 1 t/ha.
- Flood Plains: Fish culture in floodplains, rice fields, cages, and oxbow lakes collectively accounts for around 2% of total aquaculture production. The water body is managed by embankment, stocking of indigenous and exotic fish species, feeding, fertilizing etc. Production is 1-3 t/ha/year
- Shrimp and prawn production: this takes place mainly in south and southwestern Bangladesh in converted rice fields known as 'ghers'. These cover a total area of 244,000 ha. Estimated combined production of shrimp and prawn for 2010 stood at close to 98,000 t. The contribution of black tiger shrimp (Penaeus monodon) and giant freshwater prawn (Macrobrachium rosenbergii) to the Bangladesh national economy is significant. However Shrimp and prawn culture faces a range of challenges - diseases, compliance with quality standards in importing markets etc.
- Marine fisheries: the country has about 710 km long coastal belt. Continental shelf is about 37,000 km2 having upto50m depth. Total Marine catch is 497,573 t (19.4%) Hilsa (Tenualosailisha), as a single species, accounts nearly half of the total marine catches, and 12-13% of the total fish production of the country. Industrial fishery based on trawl fishery (shrimp & fish) contributes only 6.6% and artisanal fisheries contributes 93.4% of the total marine landings[28].

4.3.2 Feedings practices[29]

Raw unformulated feeds like rice bran and, to a lesser degree, mustard oil cake-are widely used throughout Bangladesh in homestead aquaculture. In some cases these feeds may be derived from on-farm sources, but are more frequently purchased in local markets and are usually of domestic (rather than imported) origin. Barman and Karim (2007) calculate that around 80,000 tonnes of raw feeds are used annually in homestead pond grow-out in Bangladesh on the basis of the assumption that 100 kg is required to produce one tonne of carps in improved extensive systems. Pellet feeding is common in intensive system.

4.3.3 Processing

In Bangladesh, the fisheries sector suffers from serious post-harvest loss every year due to ignorance and negligence in handling and processing at different stages. Improper handling and processing reduce the quality of the products. Low quality fish is of great concern to food security and public health. Post-harvest quality loss in wet fish occurred, based on different species and seasons, from 7-19%, with an average loss encountered was 12.5%. Availability of ice, quality of ice and method of icing have been the key elements for quality loss in wet fish.

[28] http://iwlearn.net/iw-projects/1252/reports/IWS-09%20Country%20Report%20-%20Bangladesh.pdf
[29] *Review of aquaculture and fish consumption in Bangladesh*. Viewed at http://www.worldfishcenter.org/resource_centre/WF_2970.pdf on 13th October 2014.

Dyes, likely to be toxic, were found to be used in a range of 29% and 55% in rohu, catla, silver carp, tilapia, bele and large snakeheads in Dhaka fish markets. Chemical pesticides (DDT, nogos, ribcod) are used in most of the dried and fermented products30. Formaldehyde is another chemical used to store fish.

4.3.4 Fish diversity

Fresh water fish[31]: Of the 260 freshwater fish found in Bangladesh more than 140 are classified as small indigenous species (SIS) that attain a maximum length of 25 cm. These fish are a particularly rich source of essential vitamins and minerals, but are increasingly scarce. Some studies have shown that in rural Bangladesh small fish make up from 50% to 80% of all fish eaten during periods of peak production.

Marine fish[32]: The IUCN Bangladesh Red Data Book (2000) has listed 442 marine fishes, 22 amphibians, 17 marine reptiles, 388 resident birds, 240 migratory birds, and 3 species of marine mammals in Bangladesh. According to the Red list of IUCN, among the marine and migratory species of animals, 4 fishes, 5 reptiles, 6 birds, and 3 mammals are threatened.

4.3.5 Key environmental issues

4.3.5.1 Fish culture

- Fishery resources have declined sharply due to environmental degradation and anthropogenic activities such as over-fishing of inshore fisheries, indiscriminate catching of juveniles, construction of barrages and dams, siltation, extensive use of pesticides, pollution etc.
- Intensive aquaculture leads to water logging and increased salinity levels and altered drainage patterns and soil quality.
- Mud snails harvested in large quantities to be used as feed for prawn production, impacts on the ecology of the areas from which they are harvested.
- Post larvae, juveniles and pre-adults of shrimps and fin fishes are extensively exploited. For example, in the coastal Sundarban area estimation provides that 97% of the shrimp fry and finfish larvae are destroyed or thrown on the land during of collection of only 3% seed of tiger prawn for shrimp culture.
- The use of fine seine nets to sieve for shrimp larvae from the wild for cultivation has been the cause decline of wild fish populations

4.3.5.2 Post harvest

- Use of insecticides for storage of dry fish, salted, smoked and fermented fish leaving harmful chemical residues (organo phosphates)
- Bad quality of ice blocks made of dirty water or improper handling spoils quality
- Practice of formalin dip in order to delay bacterial spoilage is rampant in market which highly hazardous to health.

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[30] *Post-harvest Loss Reduction in Fisheries in Bangladesh: A Way Forward to Food Security*. Viewed at http://www.nfpcsp.org/agridrupal/sites/default/files/Nowsad_Alam-PR5-08.pdf accessed on 14th October 2014.
[31] *Review of aquaculture and fish consumption in Ban*gladesh. Viewed at http://www.worldfishcenter.org/resource_centre/WF_2970.pdf on 13th October 2014
[32] *Coastal and marine biodiversity of Bangladesh (Bay of Bengal)*. Viewed at http://benjapan.org/iceab10/19.pdf

- Use of toxic dyes for fresh appearance of rohu, catla, silver carp, tilapia, bele, etc. or mixture of salt and soda (CaCO3) is used in fish and shrimp to make it firm.

4.4 Climate Change – Impacts and Adaptation Needs

Bangladesh is extremely vulnerable to the impact of climate change for the reasons it is a low-lying and very flat country which is subject to riverine flooding and vulnerable to sea level rise, and because a large portion of its population is dependent on agriculture for its livelihood. The confluence of the rivers - Ganges, the Brahmaputra, and the Meghna makes the country a deltaic plain. The extensive floodplains are the main physiographic feature of the country.

The climate of Bangladesh is characterized by high temperatures, heavy rainfall, high humidity, and fairly marked seasonal variations. The southwestern summer monsoons occur from June through September. More than 80 percent of annual precipitation occurs during the monsoon. In recent years the weather pattern has been erratic, as the cool dry season has considerably decreased in length. This change of pattern is probably attributable to climate change. Bangladesh is experiencing intense and more frequent extreme weather events such as flood and droughts, increasing abnormalities in rainy season patterns and rising sea levels are already having instant impacts on food production, incidence of food emergencies, food distribution infrastructure, human health and livelihood assets and opportunities, in both urban and rural areas.

The climate elements and critical vulnerable areas and the sectors impacted is presented in the Table 4-1.

Table 4-1: Climatic Elements, critical vulnerable areas and impacted sectors

Climate and related elements[33]	*Critical vulnerable areas*	*Most impacted sectors*
Temperature rise and drought	Northwest part	Agriculture (crop, livestock, fisheries) Water, Energy, and Health
Sea level rise and salinity intrusion	Coastal Area Island	Agriculture (crop, fisheries, livestock) Water (water logging, drinking water, urban) Human settlement Energy, Health
Floods	Central Region North East Region Char land	Agriculture (crop, fisheries, livestock), Human settlement Health, Disaster, Energy
Cyclone and storm surge	Coastal and Marine Zone	Marine Fishing Infrastructure Human settlement Life and property
Drainage congestion	Coastal Area Urban South West	Water (Navigation) Agriculture (crop)

The potential impacts of climate change on different sectors could be as described below:

[33] Final Report. *Bangladesh Agriculture and Climate Change*. Viewed at ftp://ftp.cgiar.org/ifpri/LDanessi/USAID-Reports/Final%20Report-Bangladesh%20Agriculture%20and%20Climate%20Change.pdf on 13th October 2014

4.4.1 Agriculture[34]

Every crop has a minimum and maximum temperature limit for their reproductive and vegetative growth. When temperature exceeded the upper limit or falls below the range, crop production is altered drastically. A study found that 1 0C increase temperature at reproductive, vegetative and ripening stages decreases the Aman-1 rice (May – October) production by 17.28 and 53.06 tons respectively in Bangladesh. The prospect of growing potato and wheat would be severely impaired with the temperature change (by 2^0C and 4^0C). Production loss may exceed 50% of the achievable yields. Moreover, excessive rainfall may create water logging condition and flooding that also destroys the crop production. It was found by a study that rainfall increase in 1mm decreased the production Aman rice by 0.292, 0.230 and 0.036 ton respectively. Saline water intrusion due to sea level rise will reduce agricultural production by soil degradation and unavailability of fresh water (MoEF, 2011) for irrigation. Salinity also reduces the seed germination rate. Besides crop losses and loss of infrastructure occur due to extreme weather events like cyclones, floods, droughts. Cultivable land will be reduced due to aridity, salinity.

4.4.2 Fisheries

Flood, river bank erosion, cyclone, salinity intrusion, sea level rise, storm surges and droughts will have severe impacts on fisheries. During severe events the aquaculture infrastructure may be damaged leading to fish loss, leading to loss of livelihoods of fishermen. In addition, drought, salinity intrusion, and erratic rainfall affect the fisheries sector moderately.

4.4.3 Livestock

Livestock rearing is an important source of income and livelihood options for the rural poor. The impact of climate change on livestock is expected to reduce livelihood opportunities, income, and employment opportunities of poor villagers. Sea level rise would have severe effects on poverty and economic growth of this sector; drought, salinity intrusion, and heat wave would affect the sector moderately.

[34] *Climate change threat agricultural production and food security in Bangladesh*, viewed at http://www.climateemergencyinstitute.com/uploads/M__A_Climate_Change_Threat_Agricultural_production_and_Food_Security_in_Bangladesh.pdf on 14th October

5 Environment Management Process for Crop Development

This section describes the general guidelines for mainstreaming the environmental considerations in different activities of Crop Development component of NATP-2 including research and value chain development. It also provides necessary tools for screening or assessing environmental impacts. The environmental assessment of the NATP-2 sub-projects is to be carried out following the provisions of the Environment Conservation Rules 1997 and the relevant World Bank Operational Policies (OP 4.01 Environmental Assessment and OP 4.09 Pest Management). Following sections discuss the overall process of environmental management to be followed in this component. A process flow diagram showing planning and implementation of sub-projects and various phases of environmental management process has been illustrated in Figure 5-1.

5.1 Environmental Management

The following principles will be followed in the overall environmental management of sub-projects to be implemented under the Crop Development component of NATP-2:

- Activities with severe negative environmental impacts will not be supported by NATP-2.
- Activities involving financing of CIGs, POs, SMEs will go through environmental screening and assessment and will have sub-project specific Environmental Management Plans (EMPs).
- All supported activities will ensure compliance with the relevant 'Environmental Codes of Practice'.
- 'Environmental Enhancement Measures' will be recommended specifically to address adaptation needs in the context of climate change.

The following steps or ***supporting elements*** ensure systematic implementation of environmental management:

- Reviewing negative list of attributes
- Categorization of sub-projects
- Environment assessment of sub-projects and development of EMP
- Institutional arrangements
- Monitoring
- Capacity building
- External Environmental Audit

5.2 List of Negative Attributes and Sub-projects

The following activities will not be supported under the NATP-2:

- Activities that involve drainage of wetlands for agricultural use.
- Activities that involve pesticides that fall in WHO classes IA, IB and II and pesticides banned by the Government of Bangladesh.
- Activities involving significant conversion or degradation of critical natural habitats.
- Activities within Protected Areas (Wildlife Sanctuaries and National Parks).
- Withdrawal of groundwater for irrigation that contain arsenic higher than national standard (currently 50 ppb).

- Activities that involve Genetically Modified Organisms (GMOs) that have not been approved by an independent panel of internationally recognized experts, and cleared by the World Bank.

5.3 Categorization of sub-projects

NATP-2 will fund various sub-projects / activities under the crop development component that involves research, technology demonstration (extension), and value chain development. The possible sub-projects to be funded under the NATP-2 have been categorized on the basis of the level of environmental assessment they need to go through. This categorization is provided in Table 5-1.

Table 5-1: Categorization of Sub-projects in Agriculture Sector based on EA requirement

Specific Interventions	*Sub project*	*Major Negative Impacts*	*NATP Categorization based on EA requirement*
Enhancing skills of extension workers	Trainings Information material	Nil	Excluded from EA requirement
Capacity building of CIG, PO, Non-CIG, project staffs	Trainings	Nil	Excluded from EA requirement
Promotion of good agricultural practices developed under NATP-1, Technology demonstration under AIF 2 & AIF 3	Extension on package of practices and inputs	Use of chemical fertilizers, pesticides leading to pollution, overuse of irrigation water	LEA
Homestead gardening with Women groups	Kitchen gardens	Use of chemical inputs for gardens and non-local seeds	LEA
Integrated Pest Management (IPM) and climate-smart technologies demonstration	Demonstrations	Pesticides recommended under IPM without protective gear or in high dosages, application before harvest, open disposal of pesticide containers leading health hazards, pollution.	LEA
	Trainings	Nil	Excluded from EA requirement
Promoting mechanization	Purchase and use of tractors, tillers, harvesters, Processing equipment, storage equipment	Nil	Excluded from EA requirement
ICT development	Transforming FIACs into ICT based one stop knowledge center	Nil	Excluded from EA requirement
Renovation of infrastructure	Renovation of horticulture center, seed testing lab, agro-meteorological station	Nil	Excluded from EA requirement
Enhance marker access of small holders	Aggregation of commodities/ Construction of Market	Collection points for the washing, sorting, grading of specific commodities,	LEA

Specific Interventions	*Sub project*	*Major Negative Impacts*	*NATP Categorization based on EA requirement*
	yards (CCMC)	to improving the physical infrastructure in a few rural markets, flocking of vehicles, noise and air pollution due to transport, waste management, Issues in storage.	
Infrastructure Development for agro-processing	Construction of processing units	Disposal of construction wastes. Construction related health and safety	LEA
Agro-processing for the value chains selected	Agro Processing Cold storage	Use of local resources for infrastructure – soil, water. Use of machinery demanding high energy use. Issues of safety in processing using machinery. High use of energy	DEA

5.4 Environmental Assessment of Agricultural Technology Demonstration & Value Chains

Environmental Assessment is undertaken to identify the possible impacts and required mitigation measures for a sub-project. In NATP-2 selection of sub-projects on agricultural research, technology demonstration and value chains will follow a two-step environmental assessment process.

- **Limited Environmental Assessment (LEA):** This level of environmental assessment is for those sub-projects that have relatively limited, localized and reversible environmental impacts and are classified as Green or Orange-A by the Department of Environment. Table 5-1 outlines the category of activities/sub-projects that will require LEA. The LEA is carried out by the SAAO or Upazila Agriculture Officer (UAO) and proponent of research proposals. The LEA formats to be used for crop technology demonstration and value chains development by CIG and POs are provided in Annex 4. Research concept notes (CN) will go through an environment screening using a list of exclusion criteria. The format for environmental screening of research proposals is attached in Annex 5. CNs that are eligible for funding will carry out Limited Environmental Assessment on the full proposal and the LEA format for research proposals has been provided in Annex 6.
- **Detailed Environmental Assessment (DEA):** This level of environmental assessment is for those sub-projects that have relatively significant, large scale and/or irreversible environmental impacts and are classified as Orange-B or Red by the Department of Environment. If LEA recommends carrying out further assessment for any sub-projects where environmental problems are complex and will have cumulative impacts and mitigation measures are not easily available, then DEA can be conducted. The DEA is carried out by the safeguard specialist to be based at the PIU. The outline to be used for DEA is provided in Annex 13.

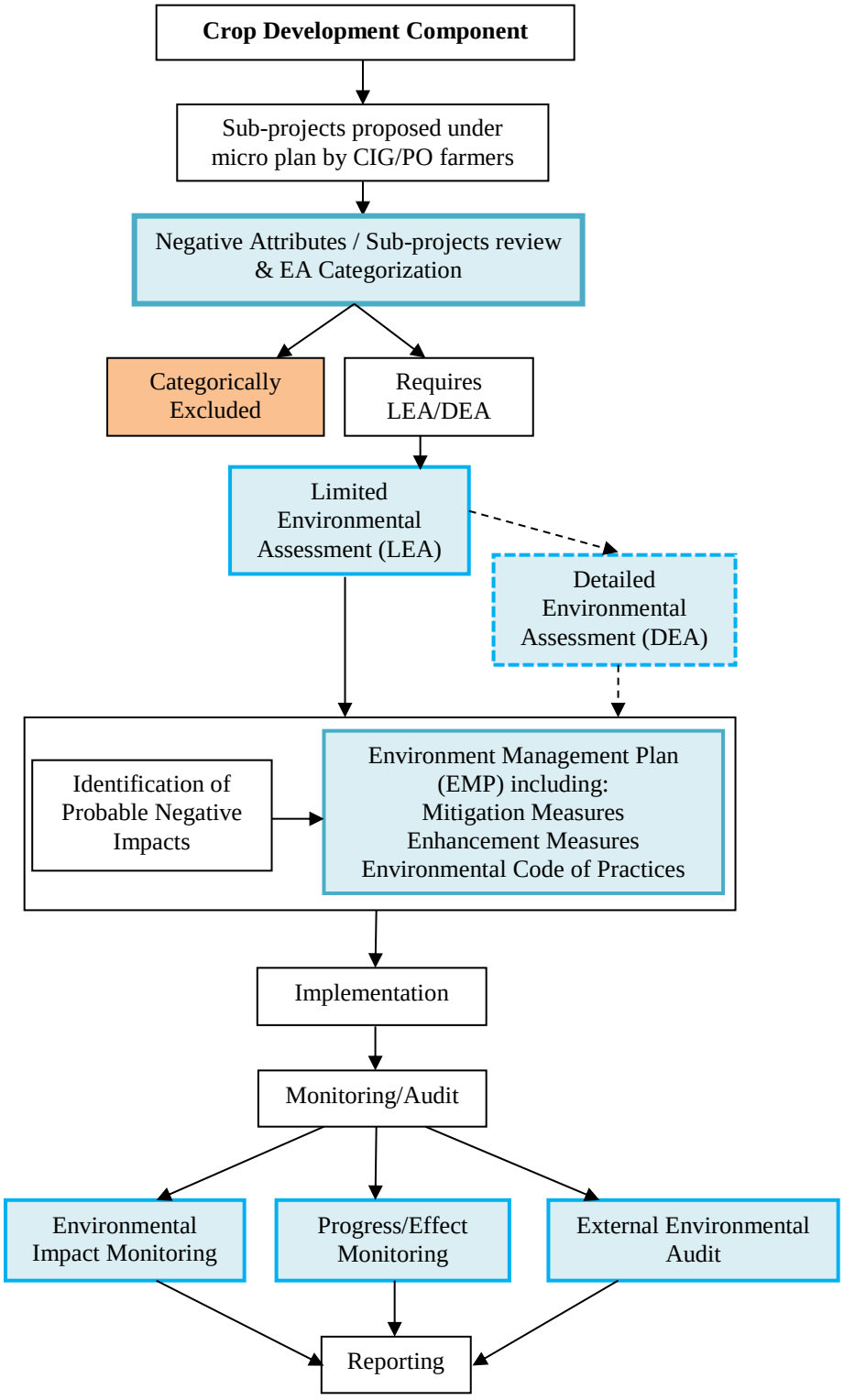


Figure 5-1: Environmental Management Process in Crop Development Component of NATP-2

5.5 Environmental Management Plan (EMP)

The outcome of the environmental assessment will be a Sub-project Environmental Management Plan (EMP).

Following the LEA, the SAAO or Upazila Agriculture Officer will prepare an EMP that will become an integral part of the sub-project proposal. The EMP will identify the technical and financial support required to implement the necessary mitigation measures. The technical support required by the CIGs, POs and SMEs to implement the mitigation measures will form part of the Upazila Extension Plan. The financial support required to implement the mitigation measures will be included in the sub-project cost. The format for the EMP for Low Impact Activities is included in Annex 4.

The major components of an EMP include: mitigation measures, enhancement measures, ECoPs, estimation of cost of EMP, environmental monitoring, and institutional arrangement for implementation of EMP. The Table 5-2 shows environmental impacts and potential mitigation measures to be recommended in the NATP-2. The EMP consists of the following components:

1. Environmental Mitigation Measures
2. Environmental Enhancement Measures
3. Environmental Code of Practices
4. Environmental Monitoring and Audit
5. Institutional Arrangements
6. Capacity Building Plan
7. Budget for implementation of EMP

5.5.1 Environmental Mitigation Measures

Most of the negative impacts that may occur through the implementation of NATP-2 sub-projects can be easily mitigated. Table 5-2 shows the list of mitigation measures suggested for sub-projects to be implemented under the crop development component of NATP-2. This list of potential impacts and mitigation measures will guide the LEA and DEA.

Table 5-2: Environmental impacts and mitigation measures for sub-projects

Nature of sub-projects to be supported	*Potential negative environmental impacts*	*Mitigation measures*
Technology demonstration/ Promotion of good agricultural practices developed under NATP 1 – IPM, Climate smart technologies.	• Introduction of high yielding varieties might have impact on local agro biodiversity. • Excess use of ground water for intensive cropping depleting the ground water resource. • Use of Arsenic contaminated water for irrigation would result in accumulation of residues through food chain. • Use of pesticides under IPM when done without following guidelines would lead to application of high doses resulting in pest resurgence and development of resistance.	• Select locally suitable varieties of crops. • Restrict to efficient methods of irrigation to avoid loss of irrigation water or water logging and salinisation. • Check the quality of water for its suitability for irrigation. • Follow the recommendations in pesticide use and safe application recommended under IPM practices. A detailed Pest Management Plan (PMP) is prepared for NATP-2, which has crop wise suggestions. The recommendations in PMP

Nature of sub-projects to be supported	*Potential negative environmental impacts*	*Mitigation measures*
	• High chemical residues in food crops. • Loss of useful insects (natural enemies to pests). • Contamination of soil and water bodies nearby due to runoff. • Open disposal of pesticide containers is hazardous to cattle, children. • Use of fertilizers under INM without following the recommendations leads to algal blooms in water bodies leading to loss of aquatic biodiversity. • Soil quality (capacity of infiltration of water) and microbial population would be affected due to high doses of fertilizers. Salinization of soil could be another problem. Greenhouse Gas emissions are associated with excess N fertilizer use. • Farm level operation without information on weather parameters might lead to ineffectiveness and repeated applications of chemicals or loss of crop.	should be followed to ensure safety of the produce and environment. • Restrict to soil test based fertilizer application and to avoid leaching use practices such as neem coating the urea. • Use of cover crops, organic manures is a good alternative to replenish organic carbon and supply micro nutrients. • Farm operations can be planned based on weather updates, and climate smart technologies like tolerant varieties, timing of sowing and harvesting should be adapted.
Promoting farm mechanization	• Spread of weeds and pathogens from one field to other field through uncleansed farm machinery and implements. This will further encourage use of fungicides and weedicides. • Use of some of the machinery such as Power weeders, Power sprayers and Power tillers will increase use of fuels and will cause emission of GHGs (Green House Gases). The exhaust fumes from this farm machinery pollute local environment quality. • There can be some safety hazards owing to use of machinery.	• Clean machinery and tools after every use to ensure no weed seed, pathogens etc. are carried over to next field. • Ensure purchase of fuel efficient models of this equipment. Proper maintenance (regular cleaning and service) would lead to enhanced efficiency. • Awareness on safe use and first aid requirements to be ensured.
Agro processing and Infrastructure Development of value chains	• Infrastructure development for Agro processing and value chains may cause harm to surrounding environment. • Use of artificial ripening agents like calcium carbide leads to health risks. • Chemical residues in raw material pose health risks.	• Ensure Location Clearance and Environment Clearance from Department of Environment. • Avoid artificial ripening agents. • Use IPM produce to the extent possible. Avoid use of water contaminated with arsenic in processing. • Use energy efficient equipment for

Nature of sub-projects to be supported	*Potential negative environmental impacts*	*Mitigation measures*
	• Processing and value addition may require high amount of energy and water depleting local fuel and water resources and increasing emissions due to energy use. • Activities like milling, shelling, crushing dehusking etc. lead to noise pollution if conducted near residential areas. In case of some commodities like rice, exposure to the fine dust during dehusking may lead to health problems among workers. • Accidents and health hazards are possible during processing involving machinery. • Unhygienic environment or practices at processing will contaminate the food products. • Processed foods when not stored properly could be contaminated with molds and mycotoxins. • Disposal of wastes openly after processing (water, seed coats, peels, etc.) after processing may create unhygienic environment due to decomposition.	processing (such as solar driers for drying banana, tomato etc.). • Noise protective equipment should be provided to the operator of the machines. • Silencer should be attached to the equipment to reduce noise from the equipment to surrounding areas. • Person using these machines must wear mask for preventing the problem related to inhalation. Exhaust fans to be installed to remove dust. • Take safety precautions and use safety gear during processing. • The processing environment should be kept clean and personal hygiene is must among the workers. • Pack and store the processed food in prescribed norms in clean, dry places to avoid contamination. • Explore the alternate uses for the wastes like composting, in cases where they cannot be put to alternate use dispose the wastes as per the prescribed procedures.
Infrastructure provision for value chains	• Cutting of trees for construction of processing facilities leads to loss of greenery. • Open disposal of debris after construction, may obstruct drains etc. • Dust and noise pollution during construction are harmful to local environment, nearby residents. • High energy use for construction activities.	• Ensure Location Clearance and Environment Clearance from Department of Environment. • Avoid cutting trees to extent possible and replant where necessary. • Dispose in landfills or reuse to the possible extent. • Take necessary precautions like spraying water to control dust etc. • Use energy efficient machinery and material to the extent possible.
Aggregation for marketing	• Movement of vehicles to and fro may cause noise, dust pollution. • Clearing of vegetation for any infrastructure facility like platforms and drying yards.	• Ensure Location Clearance and Environment Clearance from Department of Environment. • Frequent water sprinkling on the road and near ground to avoid excessive dust. • Avoid clearing to vegetation to the extent possible. In case of necessity to clear the vegetation take required permissions and do compensatory plantation.
Homestead gardens for women	• Introducing new high yielding varieties may affect local	• Would be useful to consider traditional verities with high

Nature of sub-projects to be supported	*Potential negative environmental impacts*	*Mitigation measures*
	biodiversity and may not offer necessary nutrition. • Use of chemicals is harmful to surroundings and health of consumers. • Water stagnation due to excess irrigation may cause stagnation, attract mosquitoes etc.	nutritive values. • Follow organic methods to the extent possible. • Follow efficient practices of irrigation in the gardens.
Establishing seed testing laboratory	• construction related health and safety issues • Dumping construction wastes	• Use environmental health and safety measures during construction
Enhancing skills of public extension workers	• Lack of awareness and skills on environmental issues and mitigation measures or enhancement measures may lead to ill effects on environment, health and sometimes bad performance of the technology applied.	• Awareness and skill building should duly integrate the aspects – identification of possible negative environment impacts and mitigation measures or measures to enhance the local environment.

5.5.2 Environmental Enhancement Measures

While environmental mitigation measures will be identified and implemented to reduce negative impacts, project will also implement enhancement measures to amplify or strengthen positive impacts. Some of the enhancement measures suggested for the NATP-2 are provided below:

Crop production: Promotion of organic farming with certification of produce and premium marketing could be promoted.

Value chain activities: Use of energy efficient machinery could be promoted for processing and value addition to the extent possible (for example, use of solar driers).

Climate Change Adaptation: The following measures could be promoted for climate adaptation in the small holder agriculture sector.

Selection of varieties:

- Early harvest (short-duration) rice varieties: Short-duration rice varieties from BRRI and BINA - BR 25 and BRRI Dhan 32, 33, 39, and BINA dhan7 that can be harvested in 100-110 can be grown. Average yields are around 4–5 ton/ha as compared to 2.0–2.5 ton/ha in traditional varieties. Farmers have cultivated the varieties in the districts of Kurigram, Lalmonirhat, Nilphamari, and Rangpur, where famine-like situations arise due to the long growing time of traditional varieties.
- Salt-tolerant rice varieties: Traditional rice varieties can withstand normal salinity of ≤4 ds/m.10. The salt-tolerant rice developed by BRRI and BINA - such as BRRI dhan 40, 41, 47 and BINA dhan8 and 9 can be chosen. Achievable yield at farmers' fields are 4.5–5.5 t/ha in boro season and 4.0–4.5 t/ha in aman (wet season). These varieties require 130–135 days in the boro season and 120–125 days during the aman season for harvesting. These varieties can tolerate moderate salinity, up to 6 ds/m. BINA has developed BINA dhan 8 and 9, which can be cultivated also in both aman and boro seasons and are capable of withstanding salinity of 8–10 ds/m. These yield is 4.0–5.5 t/ha.
- Submergence-tolerant rice varieties: Three varieties of flood-resistant rice - BR-11 Sub 1, Swarna Sub-1 and IR-64, developed by IRRI. According to BRRI, all three strains can survive under water for more than 15 days, meaning they can withstand heavy floods.
- Drought tolerant varieties: Cultivation of drought tolerant crops BR 42, BR43, and BINA Dhan 7 in drought prone areas can be encouraged.

Cropping systems in tune with changing climates:

- Sorjan System: The sorjan cropping system is a series of constructed raised beds and lowered sinks. In the drylands, crops are grown on the beds. In wetlands, crops can be simultaneously cultivated on both the beds and the sinks. Several cropping patterns using this system have been piloted in Bangladesh. Due to the versatility of this method, it is widely adopted by farmers. All year round, vegetables, spices, and fruits are grown on raised beds. Creeper vegetables are grown on the edges of the sinks. Fish are often cultivated in the sinks.

- Floating Bed Agriculture: Floating beds are created using water hyacinth in water bodies on which vegetables seedlings are planted. This practice is prevalent in wetland areas of Bangladesh. Preparation of these platforms creates employment in the floodplains during the rainy season.

5.5.2.1 Irrigation and Water management

Traditional Irrigation Methods: The Seuni, or Swing basket, is a scoop operated by two to four persons who swing it on a rope tied to its four corners. This method can raise water by approximately 5 meters. The Lata or Dhenkli is used to raise water from shallow wells. This device uses a bamboo pole on a fulcrum with another small bamboo tied to its lower end.

Non-Traditional Irrigation Methods:

- Manual Tube wells: This technology utilizes a high bamboo pole which is placed on a bamboo post. The weight is fixed to the shorter end of the pole and balances a bucket suspended at the opposite end of the pole. The bucket is lowered into a dug well until the bucket fills with water. Later the bucket is pulled up by the counter weight. The bucket can be used where water levels are within 2m to 3m of the ground surface.
- Manually Operated Shallow Tubewells for Irrigation (MOSTIs): MOSTIs are hand tube wells, constructed manually by using locally produced casings and screens, and equipped with a variety of manually operated pumps.
- Treadle Pumps: This technology is widely used in areas where water levels are shallow. The treadle pump consists of a pipe on top of a shallow tube well, which sucks water and is then connected to two parallel pump cylinders with a plunger.
- Rower Pump: The rower pump uses a 50–75mm diameter PVC pipe as the pump cylinder, connected to the top of the suction pipe on the tube well. The piston in the cylinder is operated by pulling and pushing on a handle at the end of the piston rod using a rowing action.
- Alternate Wetting and Drying Technology: Alternate wetting and drying method is an important technology to use irrigation water judiciously for rice in the boro season. This technique requires a 30cm long pipe with a diameter of 10cm, placed in paddy fields within 10–15 days of seedling transplantation, in such a way that the perforated 20 cm portion of the pipe is buried under the soil and 10 cm remains above surface. At the time of pipe placement, 5 cm of water must be standing in the field. Irrigation is required when the water level in the pipe goes down to 15 cm (that is, 5 cm below the soil surface), to bring the water level back to 5 cm above the soil. This cycle of water maintenance should continue for up to 45 days during transplantation of rice seedlings to the field. At the time of panicle initiation, 2–3 cm of water should be maintained in the crop field. Four to five irrigations could be saved in rice fields with the use of alternate wetting and drying (AWD) technology, reducing requirements of water, fuel, and money, without affecting the yield (BRRI 2010).
- List of some more adaptation options being practiced in some vulnerable areas of Bangladesh is presented in Table-5-6.

- Follow other adaptation practices like:
    - Spreading ash to keep the soil warm during winter

- In drought-prone areas: zero tillage, priming of seeds during sowing, mulching, relay cropping, dry seeding, rainwater harvesting, and planting short-duration varieties
- In flood-prone and salinity/tidal surge areas: zero tillage, sorjan system, and floating bed agriculture

Fertilizer Management:

- Fertilizer based on Leaf Colour Chart - Leaf Color Chart (LCC) is made of plastic and consists of four colors, to show the amount of urea required by plant specimens. The top leaf of a plant should be matched to one of the darker colors of the LCC based on which, the fertilizer dose will be decided. BRRI supports the usage of this technology, and the department of agricultural extension provides training on leaf color charts to farmers (BRRI 2010).
- Use of Urea Super Granule Technology: Urea super granule (USG) is a heavy form of urea granule. Use of USG increases effectiveness of urea by roughly 20–25 percent as compared to the conventional urea application. With the use of USG, 65 kg/ha urea can be saved in the aus (March – June) and aman (May – October) seasons, and 80–100 kg/ha urea in the boro season. The application of USG is also environment friendly, since loss of N from USG to the environment is greatly reduced. Use efficiency of USG is much greater than conventional urea application (BRRI 2010).
- Application of organic fertilizers: Organic matter is considered the life of soil and improves soil fertility through chemical, physical, and biological properties. Organic manure like cow dung, compost, poultry litter, green manures (eg: sesbania) should be applied at least once a year at the rate of 5 t/ha.

Pesticide Management:

- Integrated Pest Management: Integrated Pest Management (IPM) could be followed which benefits from non-chemical methods of pest management and applies pesticide as last measure. This is based on up-to-date scientific information on the life cycles of pests, weather factors etc. to provide the most effectiveness at the lowest cost with the least harm to the environment.
- Traditional methods of pest management also need to be evaluated and applied to the extent possible.

A detailed Pest Management Plan (PMP) is prepared for the project which is available as separate document which need to be followed to avoid climate hazards due to pesticide use.

5.5.3 Environmental Codes of Practice

The following Codes of Practice will be applicable, as relevant, to all activities supported under the Agriculture Components of the NATP-2.

Crop production (relevant for all selected crop value chains):

Irrigation: Follow the irrigation schedules and technologies specified by the DAE; Quality of irrigation water should be tested; Water efficient methods of irrigation should be followed.

Fertilizers: Follow the Integrated Nutrient Management (INM) practices prescribed by the Department of Agricultural Extension (DAE). Fertilizer use should be based on soil testing. Fertilizer application should follow recommended dosage and methods.

Pesticides:

- Avoid use of pesticides that are classified as hazardous. Use pesticides in recommended doses at recommended times following all precautionary measure to avoid health hazards or contamination of surrounding environment.
- Avoid the use of pesticides that fall under the World Health Organization *Recommended Classification of Pesticides by Hazard* Classes 1a and 1b.
- Avoid the use of pesticides that fall under the World Health Organization *Recommended Classification of Pesticides by Hazard* Class II if they are likely to be accessible to personnel without proper training, equipment, and facilities to handle, store, apply, and dispose of these products properly.
- Avoid the use of pesticides listed in Annexes A and B of the Stockholm Convention, except under the conditions noted in the convention.
- Use only pesticides that are manufactured under license and are registered and approved by the Government of Bangladesh and are in accordance with the Food and Agriculture Organization's (FAO's) International Code of Conduct on the Distribution and Use of Pesticides.
- Use only pesticides that are labeled in accordance with international standards and norms, such as the FAO's Revised Guidelines for Good Labeling Practice for Pesticides.
- Follow the Integrated Pest Management (IPM) practices prescribed by the Department of Agricultural Extension (DAE) and provided in Pest Management Plan (PMP) for NATP-2 which is available as separate document.
- Train personnel to apply pesticides and ensure that personnel have received applicable certifications or equivalent training where such certifications are not required.
- Review the manufacturer's directions on maximum recommended dosage or treatment as well as published reports on reduced rate of pesticide application without loss of effect (such as DAAS 2000), and apply the minimum effective dose.
- Maintain and calibrate pesticide application equipment in accordance with manufacturer's recommendations.
- Clean (e.g., a triple rinse or pressure technique) and dispose off (e.g., through crushing, shredding, or return to suppliers) pesticide packaging and containers to ensure that they are not subsequently used as containers for food or drinking water.

A Pest Management Plan (PMP) has been prepared for the project as a separate document which should be followed to avoid hazards due to pesticide use.

Value chain activities:

- Follow the norms and guidelines prescribed for food processing industries by the Government of Bangladesh.
- Prescribed safety standards should be followed in food processing.

- Avoid use of Arsenic contaminated water for food processing.
- Avoid using artificial ripening agents (calcium carbide).
- Minimize inventory storage time for raw materials to reduce losses from putrefication.
- Monitor and regulate refrigeration and cooling systems during storage and processing activities to minimize product loss, optimize energy consumption, and prevent odors.
- Contain solid waste in dry form and consider disposal through composting and/or use for soil amendment.
- Avoid dust and aerosol-generating activities (such as use of compressed air or high-pressure water for cleaning) and, where they cannot be avoided, provide proper ventilation of enclosed or semi-enclosed areas to reduce or eliminate exposure to dust and aerosols.
- Install exhaust ventilation equipped with filters, cyclones, etc., at sources of dust.
- Provide workers with personal protective equipment that is appropriate for the process or activity, e.g. masks and gloves.
- Prescribed standards of hygiene should be followed in processing of food products (horticulture, vegetables etc.) Ensure physical segregation of work and welfare facilities to maintain hygiene.
- Follow safety protocols in operation and use of machinery. Ensure availability of first aid kits.

5.5.4 Environmental Monitoring Plan

The effectiveness of implementation of this EMF depends to a large extent on the implementation support provided at various levels. Monitoring to identify and suitably address any issues is thus important. Two types of monitoring will be implemented: i) sub-project environmental field monitoring and ii) environmental impact monitoring. Figure 5-2 shows the flow diagram of environmental monitoring system in NATP-2. Field monitoring of technology demonstration sub-projects will be carried out once in a cropping season while monitoring of research and value chains will be on annual basis. The monitoring plan of crop development component is outlined in Table 5-3 and monitoring formats are presented in Annexes 7-12.

Figure 5-2: Environmental Monitoring Plan in Crop Development Component of NATP-2

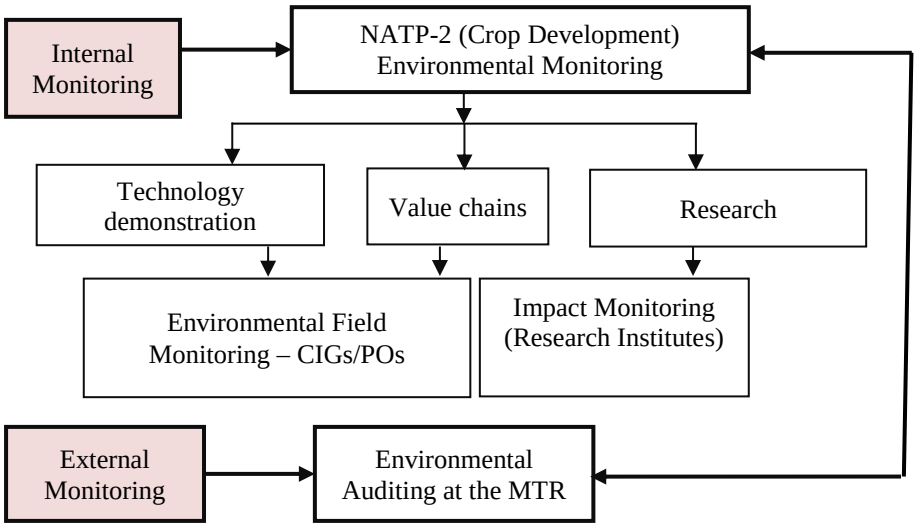


Table 5-3: Monitoring plan for Agriculture Components of NATP-2

Level	*Monitoring Responsibility*	*Monitoring Focus*	*Monitoring Methodology*	*Monitoring Frequency*
Techno-logy demo, new technology adoption	Sub-Assistant Agriculture Officer (SAAO)	Environmental Field Monitoring implementation of mitigation measures, Environmental Codes of Practice, Enhancement Measures	Field visits to every CIG, PO	Once in a cropping season
Value chains	Sub-Assistant Agriculture Officer (SAAO)/ Upazila Agriculture Officer	Monitoring implementation of mitigation measures, Environmental Codes of Practice, Enhancement Measures	Field visits to CIG, PO	Yearly
Research	Focal Point for Environmental Safeguards in PIU	Monitoring implementation of mitigation measures, Environmental Codes of Practice, Enhancement Measures	Desk/report review; Visits to subproject proponent research institutions	Yearly

5.5.5 External Environmental Audit

The PIU will hire an independent consultant agency to undertake an external environmental audit of the project. This audit will be undertaken prior to the mid-term review so that environmental assessment and monitoring system crop component can be improved. The Terms of Reference for this audit are provided in Annex 14.

5.5.6 Institutional Arrangements

The key roles and responsibilities on environmental management are described in the Table 5-4.

Table 5-4: Roles and Responsibilities on Environmental Management in the Agriculture Component of NATP-2

Level	*Role*	*Responsibility*
Union	Sub-Assistant Agriculture Officer (SAAO)	Conduct LEA of low impact sub-projects. Provide technical support to CIGs, POs and SMEs on implementation of mitigation measures, Environmental Codes of Practice and Enhancement Measures. Conduct environmental awareness and training for the CIG and non-CIG farmers
Upazila	Upazila Agriculture Officer (UAO)	Review LEAs of all CIG, PO and SME sub-projects. Coordinate the functioning of the SAAOs. Monitor the implementation of mitigation measures, Environmental Codes of Practice and Enhancement Measures. Conduct environmental awareness and training for the CIG and non-CIG farmers
District	District Agriculture Officer	Monitor the implementation of mitigation measures, Environmental Codes of Practice and Enhancement Measures. Coordinate and support the UAOs in implementation of the EMF.
National (PIU)	Focal Point for Environmental Safeguards in PIU-DAE	Review environmental documentation in sub-project proposals to ensure that the prescribed environmental management practices (as described in this EMF) are implemented. Ensure that excluded activities are not financed. Provide assistance to district and upazila level staff in undertaking environmental screening and assessment of CIG, PO sub-projects. Verify sub-project environmental categorization.

Level	*Role*	*Responsibility*
		Provide assistance to subproject proponent institutions (supported for research and institutional capacity building) in determining environmental issues, identifying and implementing actions from the Environmental Code of Practices, filling out required documentation, etc. Conduct Detailed Environmental Assessment. Conduct formal and on the job training for SAAO, UAO & DAO.

5.5.7 Capacity Building

The environmental soundness of the interventions supported under the NATP depend to a large extent on the capacity of the beneficiary communities and line department staff to identify and suitably address any environmental impacts, and, to actively promote better environmental management.

The plan for capacity building of the communities and line department staff is outlined in Table 5-5.

Table 5-5: Capacity Building Plan for Crop Component of NATP-2

Level	*Trainee Profile*	*Training Focus*	*Key Training Methodology*	*Training Frequency*	*Training Duration*
Community	CIGs, non-CIGs, POs, SMEs	Environmental awareness program for all CIGs, POs and SMEs	Community video and discussion	Prior to sub-project proposal preparation	Half day
		Sub-project specific, skill-based training on implementation of mitigation measures to be organized for every CIG, PO and SME on themes including: • Environmental Codes of Practice • Integrated Pest Management and Pesticide Safety, Pest Management Plan (PMP) for NATP • Integrated Nutrient Management • Organic Farming • Water conservation • Climate adaptation • Food Safety	Exposure visits; Demonstration units; Hands-on sessions	Prior to initiation of sub-project implementation	2 days
Union	Sub-Assistant Agriculture Officer (SAAO)	Sub-project specific, skill-based training on environmental management (mitigation measures, Environmental Codes of Practice, Enhancement Measures). The themes include: • Environmental Codes of Practice • Integrated Pest Management and Pesticide Safety, Pest Management Plan (PMP) for NATP • Integrated Nutrient Management • Organic Farming • Water conservation • Climate adaptation • Food Safety	Class-room sessions; Exposure visits; Hands-on sessions	Six-monthly	2 days
Upazila	Upazila Agriculture Officer	Environmental Screening and Assessment & monitoring	Class-room sessions; Exposure visits; Hands-on sessions	Six-monthly	2 days
District	District Agriculture Officer	Overview of the Environmental Management Framework for the NATP	Class-room sessions; Exposure visits	Annual	1 days

5.5.8 Budget

The budget for implementation of the EMF for the crop component of the NATP-2 is outlined in Table 5-6.

Table 5-6: Budget for Crop Development Component of NATP-2

	Agriculture	*Unit*	*Unit cost (BDT)*	*No. of units*	*Total*
1	Capacity Building				
	Environmental awareness program for 28290 CIGs, POs, SMEs	Batch	10000	566	5658000
	Sub-project specific skill based training for 28290 CIGs, POs, SMEs	Batch	30000	566	16974000
	Environmental Assessment and sub-project specific skill based training for SAAOs (9 per 270 Upazilas)	Batch	30000	486	14580000
	Environmental Assessment Training for UAOs (1 per 270 Upazilas)	Batch	50000	54	2700000
	Orientation on EMF for DAOs	Batch	10000	1	10000
2	External Environmental Audit	Study	1000000	1	1000000
	Total				40922000

5.5.9 Construction and Civil Works

All construction activities must incorporate standards for public and worker safety prescribed by the Government of Bangladesh (e.g., use of protective gear by construction workers, fencing off construction sites to prevent unauthorized public access, rehabilitation of borrow pits, compensatory plantation for any felled trees, etc.). Annex 15 describes the special environmental clauses for tender documents.

5.5.10 Climate Risk Assessment and Adaptation

All agriculture activities will incorporate climate risk assessment as part of the LEA/DEA and integrate adaptation measures as part of the EMPs. The Table 5-7 lists the adaptation measures that are being practiced in climate vulnerable areas of Bangladesh.

Table 5-7: List of adaptation options being practiced in vulnerable areas in Bangladesh

Climate Risk	*Adaptation measures*[35]
Drought	• Zero/minimum tillage potato cultivation by using water hyacinth/straw as mulch materials • Chickpea cultivation by using priming technique • Supplementary irrigation in T. Aman (May – October) from mini pond • Year round homestead vegetables cultivation • Pond water harvesting to cultivate rabi vegetables
Flood	• Zero/minimum tillage to cultivate potato, aroid and ground nut with water hyacinth and straw mulch in rabi season in medium high land in flood prone area • Zero tillage cultivation of mashkalai, khesari and mustard in rabi season in

[35] Final report, Bangladesh Agriculture and Climate Change viewed at ftp://ftp.cgiar.org/ifpri/LDanessi/USAID-Reports/Final%20Report-Bangladesh%20Agriculture%20and%20Climate%20Change.pdf on 13th October 2014

	medium high land • Floating bed vegetables cultivation during wet months • Cultivating kaon (millet) in char land in kharif-1 • Modified sorjan system (trench and furrow) for vegetable cultivation in char lands • Raising vegetables seedlings in poly bags near homestead in rabi and early kharif–l season in medium high land • Relay cropping of sprouted seeds of Aman rice in jute field (before 15–20 days of jute harvest) in medium high land
Coastal	• Sorjan system of cropping in tidally flooded/water stagnant areas • Raising early rabi vegetable seedlings in poly bags for vegetables production in high land and medium high land

5.6 Review and Approval

After receiving the completed Environment Screening, LEA or DEA report of the selected sub-project, the PIU Environment Safeguards Specialist will assess the adequacy of the mitigation measures and EMP. This assessment will be conducted through desk review and field visits and concentrated on the quality of the baseline information, identification of potential impacts, effectiveness and the adequacy of the mitigation measures, and monitoring plan. This report will be submitted to the PD for approval and further action.

5.7 Compliance Check by IDA

MoA will seek concurrence of the World Bank Team in view of their compliance with environment guidelines. IDA can ask for further clarification for strengthening the environmental documentation. In that case, MoA will take necessary action to improve or revise the document and resubmit to the IDA for re-examination.

6 Environment Management Process for Livestock Development

This section describes the general guidelines for mainstreaming the environmental considerations in different activities of Livestock Development component of NATP-2 including research and value chain development. It also provides necessary tools for screening or assessing environmental impacts. The environmental assessment of the NATP-2 sub-projects is to be carried out following the provisions of the Environment Conservation Rules 1997 and the relevant World Bank Operational Policies (OP 4.01 Environmental Assessment). Following sections discuss the overall process of environmental management to be followed in this component. A process flow diagram showing planning and implementation of sub-projects and various phases of environmental management process has been illustrated in Figure 6-1.

6.1 Environmental Management

The following principles will be followed in the overall environmental management of sub-projects to be implemented under the Livestock Development component of the NATP-2:

- Activities with severe negative environmental impacts will not be supported by NATP-2.
- Activities involving financing of CIGs, POs will go through environmental screening and assessment and will have sub-project specific Environmental Management Plans (EMPs).
- All supported activities will ensure compliance with the relevant 'Environmental Codes of Practice'.
- 'Environmental Enhancement Measures' will be recommended specifically to address adaptation needs in the context of climate change.

The following steps or ***supporting elements*** ensure systematic implementation of the system for environmental management:

- Reviewing negative list of attributes
- Categorization of sub-projects
- Environment assessment of sub-projects and development of EMP
- Institutional arrangements
- Capacity building
- Monitoring
- External Environmental Audit

6.2 List of Negative Attributes and Sub-projects

The following activities will not be supported under the NATP-2:

- Activities that are not in compliance with the laws and regulations of the Government of Bangladesh (including Environment Conservation Rules 1997, Food Safety Act 2013, Animal Slaughter and Meat Control Act 1957).
- Activities that involve significant conversion or degradation of critical natural habitats and cultural property resources.
- Activities that involve Genetically Modified Organisms (GMOs) that have not been approved by an independent panel of internationally recognized experts, and cleared by the World Bank and the Government of Bangladesh.

6.3 Categorization of Sub-projects

NATP-2 will fund various sub-projects / activities under the Livestock Development component that coves research, technology demonstration (extension), and value chain development. The possible sub-projects to be funded under the NATP-2 have been categorized on the basis of the level of environmental assessment they need to go through. This categorization is provided in Table 6-1.

Table 6-1: Categorization of sub-projects in Livestock Sector based on EA requirement

Nature of sub-projects to be supported	*Potential negative environmental impacts*	*DoE Categorization*	*NATP Categorization based on EA requirement*
Modern management for dairy, sheep and buffalo farming	• Land/vegetation degradation due to overgrazing • Pollution from poor manure management. • Health risk (zoonotic diseases) from poor housekeeping and handling. • Promotion of only exotic breeds may lead to gradual extinction of indigenous breeds.	Orange-A (10 cattle heads or below in urban areas and 25 cattle heads or below in rural areas) Orange-B (above 10 cattle heads in urban areas and above 25 cattle heads in rural areas)	LEA (10 cattle heads or below in urban areas and 25 cattle heads or below in rural areas) DEA (above 10 cattle heads in urban areas and above 25 cattle heads in rural areas)
Introduction of sheep and buffalo rearing in low lying areas	• Land/vegetation degradation due to overgrazing. • Pollution from poor manure management. • Health risk (zoonotic diseases) from poor housekeeping and handling. • Promotion of only exotic breeds may lead to gradual extinction of indigenous breeds.	Orange-A (10 cattle heads or below in urban areas and 25 cattle heads or below in rural areas) Orange-B (above 10 cattle heads in urban areas and above 25 cattle heads in rural areas)	LEA (10 cattle heads or below in urban areas and 25 cattle heads or below in rural areas) DEA (above 10 cattle heads in urban areas and above 25 cattle heads in rural areas)
Enhanced beef fattening using urea-molasses-straw mixes	• Health risk from unauthorized use of anabolic steroids and feed additives.	Orange-A (10 cattle heads or below in urban areas and 25 cattle heads or below in rural areas)	LEA
Goat rearing using slat system for housing	• Land/vegetation degradation due to overstocking. • Pollution from poor manure management. • Health risk (zoonotic diseases) from poor housekeeping and handling.	None	LEA
Production management for high yielding varieties of green fodder;	• Pollution and health risk from improper selection and use of pesticides. • Groundwater depletion	None	LEA

Nature of sub-projects to be supported	*Potential negative environmental impacts*	*DoE Categorization*	*NATP Categorization based on EA requirement*
Promotion of salinity tolerant fodder varieties in coastal areas	due to over-extraction of for irrigation. • Promotion of only exotic species/varieties may lead to gradual extinction of knowledge on native fodder species/varieties.		
Silage and hay production	• Health risk from poor housekeeping and handling. • Groundwater contamination due to leachate from silos.	None	LEA
Chaff cutters	• Safety risk during operation.	None	LEA
Bio-gas production	• Pollution and health risk from poor slurry management. • Groundwater contamination due to leachate from slurry pit.	None	LEA
Manure management in dung pits	• Pollution and health risk from poor management. • Groundwater contamination due to leachate from pit.	None	LEA
Milking machines	• Contamination of milk due to poor hygiene practices.	None	LEA
Milk collection	• Contamination of milk due to poor hygiene practices.	None	LEA
Improved small-scale slaughterhouses and dressing houses for safer meat production	• Health risk (zoonotic diseases) from poor housekeeping and handling. • Contamination of meat due to poor hygiene practices. • Pollution due to improper disposal of solid and liquid wastes.		LEA
Input marketing	• Increase in use of chemical inputs in agriculture. • Increase in use of hazardous chemical pesticides. • Risk of trading in banned or sub-standard chemical inputs. • Health risk from poor housekeeping and handling.	None	LEA
Commodity	• Health risk from poor	None	LEA

Nature of sub-projects to be supported	*Potential negative environmental impacts*	*DoE Categorization*	*NATP Categorization based on EA requirement*
marketing	housekeeping and handling.		
Marketing facilities for sale of goats	• Health risk (zoonotic diseases) from poor housekeeping and handling.	None	LEA
Mini-feed compounding and mixing units	• Health risk from unauthorized use of anabolic steroids and feed additives. • Health risk from poor housekeeping and handling.	Orange-B	DEA
Chilling plants for milk conservation	• Contamination of milk due to poor hygiene practices. • Pollution due to improper disposal of waste water.	Orange-B	DEA
Milk pasteurization	• Contamination of milk due to poor hygiene practices. • Pollution due to improper disposal of waste water.	Orange-B	DEA
Preparation of indigenous dairy products	• Health risk from poor housekeeping and handling. • Health risk from use of unauthorized additives such as food colourants.	Orange-B	DEA

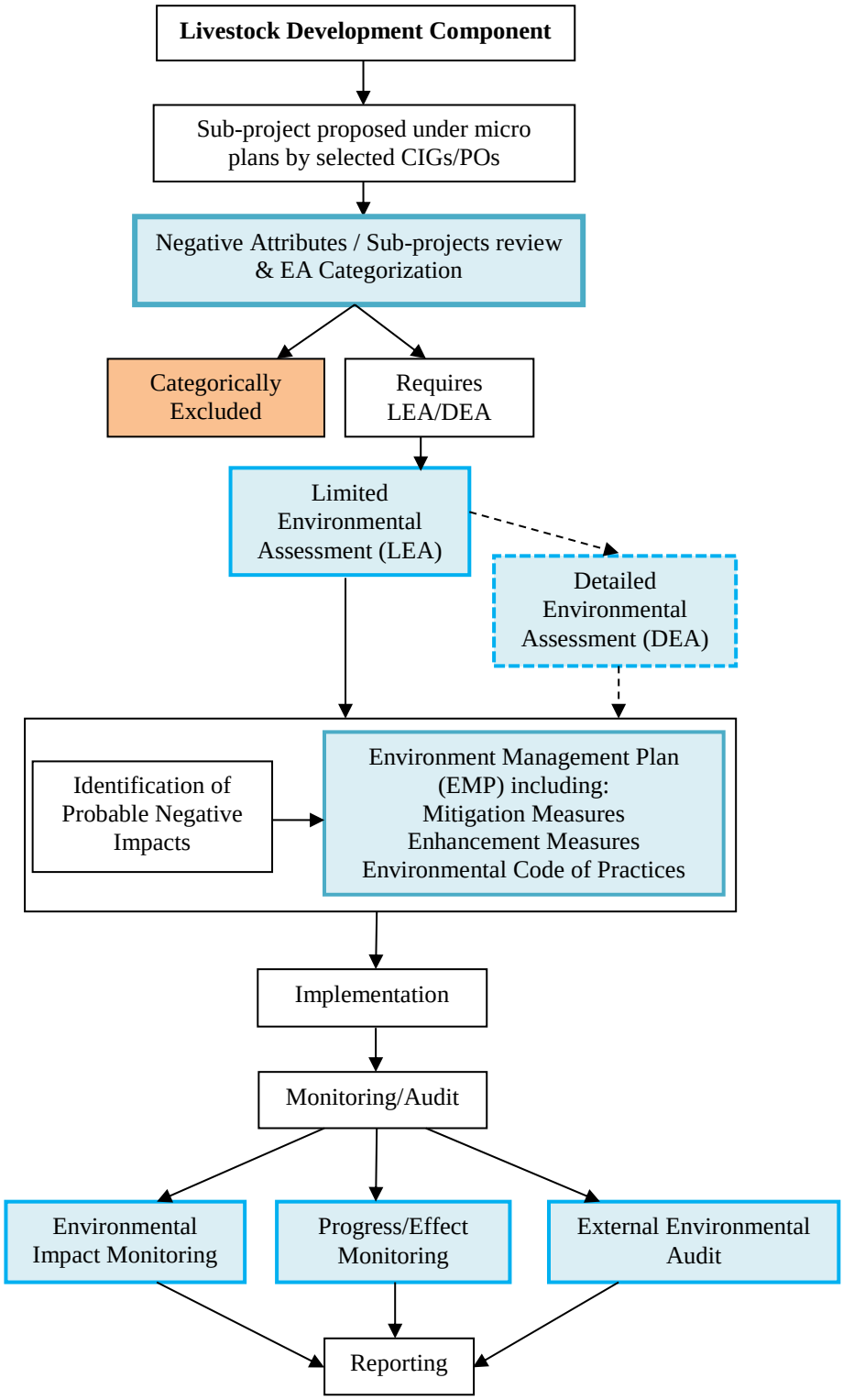
6.4 Environmental Assessment of Livestock Technology Demonstration & Value Chains

Environmental Assessment is undertaken to identify the possible impacts and required mitigation measures for a sub-project. In NATP-2 selection of sub-projects on livestock research, technology demonstration and value chains will follow a two step environmental assessment process.

- **Limited Environmental Assessment (LEA):** This level of environmental assessment is for those sub-projects that have relatively limited, localized and reversible environmental impacts and are classified as Green or Orange-A by the Department of Environment. The Table 6-1 outlines the category of activities/sub-projects that will require LEA. The LEA is carried out by the Upazila Livestock Officer (ULO) and proponent of research proposals. The LEA formats to be used for livestock demonstration and value chains development by CIG and POs are provided in Annex 4. Research concept notes (CN) will go through an environment screening using a list of exclusion criteria. The format for environmental screening of research proposals is attached in Annex 5. CNs that are eligible for funding will carry out Limited Environmental Assessment on the full proposal. The LEA format for research proposals has been provided in Annex 6.

- **Detailed Environmental Assessment (DEA):** This level of environmental assessment is for those sub-projects that have relatively significant, large scale and/or irreversible environmental impacts and are classified as Orange-B or Red by the Department of Environment. If LEA recommends carrying out further assessment for any sub-projects where environmental problems are complex and will have cumulative impacts and mitigation measures are not easily available, then DEA can be conducted. The DEA is carried out by the safeguard specialist to be based at the PIU. The outline to be used for DEA is provided in Annex 13.

Figure 6-1: Environmental Management Process in Livestock Development Component of NATP-2



6.5 Environmental Management Plan (EMP)

The outcome of the environmental assessment will be a Sub-project Environmental Management Plan (EMP).

Following the LEA, the Upazila Livestock Officer will prepare an EMP that will become an integral part of the sub-project proposal. The EMP will identify the technical and financial support required to implement the necessary mitigation measures. The technical support required by the CIGs, POs and SMEs to implement the mitigation measures will form part of the Upazila Extension Plan. The financial support required to implement the mitigation measures will be included in the sub-project cost. The format for the EMP for low impact activities is included in Annex 4.

The major components of an EMP include: mitigation measures, enhancement measures, ECoPs, estimation of cost of EMP, environmental monitoring, and institutional arrangement for implementation of EMP. The Table 6-2 shows environmental impacts and potential mitigation measures to be recommended in the NATP-2. The EMP consists of the following components:

1. Environmental Mitigation Measures
2. Environmental Enhancement Measures
3. Environmental Code of Practices
4. Environmental Monitoring and Audit
5. Institutional Arrangements
6. Capacity Building Plan
7. Budget for implementation of EMP

6.5.1 Environmental Mitigation Measures

Most of the negative impacts that may occur through the implementation of NATP-2 sub-projects can be easily mitigated. The Table 6-2 shows the list of mitigation measures suggested for sub-projects to be implemented under the livestock development component of NATP-2. This list of potential impacts and mitigation measures will guide the LEA and DEA.

Table 6-2: Environmental impacts and mitigation measures for sub-projects

Nature of sub-projects to be supported	*Potential negative environmental impacts*	*Mitigation measures*
Modern management for dairy, sheep and buffalo farming	• Land/vegetation degradation due to overgrazing. • Pollution from poor manure management. • Health risk (zoonotic diseases) from poor housekeeping and handling. • Promotion of only exotic breeds may lead to gradual extinction of indigenous breeds.	• Ensure Location Clearance and Environment Clearance as applicable from Department of Environment. • Fodder management incorporating fodder cultivation, stall feeding, rotational grazing, supplementary feeds, use of chaff cutter, etc. • Improved composting methods – pit composting. • Maintenance of safe distance between manure pit and water sources. • Construction of shed location and design as per technical recommendations. • Maintenance of shed sanitation and hygienic handling. • Promotion of improved indigenous breeds.
Introduction of sheep and buffalo rearing in low	• Land/vegetation degradation due to	• Ensure Location Clearance and Environment Clearance as applicable from

Nature of sub-projects to be supported	*Potential negative environmental impacts*	*Mitigation measures*
lying areas	overgrazing. • Pollution from poor manure management. • Health risk (zoonotic diseases) from poor housekeeping and handling. • Promotion of only exotic breeds may lead to gradual extinction of indigenous breeds.	Department of Environment. • Fodder management incorporating fodder cultivation, stall feeding, rotational grazing, supplementary feeds, use of chaff cutter, etc. • Improved composting methods – pit composting. • Maintenance of safe distance between manure pit and water sources. • Construction of shed location and design as per technical recommendations. • Maintenance of shed sanitation and hygienic handling. • Promotion of improved indigenous breeds.
Enhanced beef fattening using urea-molasses-straw mixes	• Health risk from unauthorized use of anabolic steroids and feed additives.	• Use only feed mixtures that meet prescribed standards. • Avoid use of unauthorized anabolic steroids and feed additives.
Goat rearing using slat system for housing	• Land/vegetation degradation due to overstocking. • Pollution from poor manure management. • Health risk (zoonotic diseases) from poor housekeeping and handling.	• Fodder management incorporating fodder cultivation, stall feeding, rotational grazing, supplementary feeds, use of chaff cutter, etc. • Improved composting methods – pit composting. • Maintenance of safe distance between manure pit and water sources. • Construction of shed location and design as per technical recommendations. • Maintenance of shed sanitation and hygienic handling. • Promotion of improved indigenous breeds.
Production management for high yielding varieties of green fodder; Promotion of salinity tolerant fodder varieties in coastal areas	• Pollution and health risk from improper selection and use of pesticides, fertilizers. • Groundwater depletion due to over-extraction of for irrigation. • Promotion of only exotic species/varieties may lead to gradual extinction of knowledge on native fodder species/varieties.	• Avoid use of pesticides in WHO classes IA, IB and II. • Integrated pest management, Integrated Nutrient Management. • Safe use of pesticides including personal protective equipment and safe disposal of containers. • Safe interval between use of pesticides and harvest. • Efficient irrigation methods. • Promotion of improved indigenous fodder species/varieties.
Silage and hay production	• Health risk from poor housekeeping and handling. • Groundwater contamination due to leachate from silos.	• Maintenance of safe distance between silo and water sources and water bodies. • Tap leachate and reuse as liquid manure as part of an integrated nutrient management plan.
Chaff cutters	• Safety risk during operation.	• Locate chaff cutter so as to prevent easy access by children. • Use chaff cutters with in-build safety mechanisms.
Mini-feed compounding and mixing units	• Health risk from unauthorized use of anabolic steroids and feed	• Ensure Location Clearance and Environment Clearance from Department of Environment.

Nature of sub-projects to be supported	*Potential negative environmental impacts*	*Mitigation measures*
	additives. • Health risk from poor housekeeping and handling.	• Ensure that feed meets prescribed standards. • Avoid use of unauthorized anabolic steroids and feed additives. • Maintenance of sanitation and hygienic handling.
Bio-gas production	• Pollution and health risk from poor slurry management. • Groundwater contamination due to leachate from slurry pit.	• Maintenance of safe distance between slurry pit and water sources. • Lined slurry pit to avoid seepage. • Regular and periodic slurry removal to avoid accumulation.
Manure management in dung pits	• Pollution and health risk from poor management. • Groundwater contamination due to leachate from pit.	• Maintenance of safe distance between dung pit and water sources.
Milking machines	• Contamination of milk due to poor hygiene practices.	• Maintenance of sanitation and hygienic handling. • Regular cleaning and disinfection of milking equipment.
Milk collection	• Contamination of milk due to poor hygiene practices.	• Maintenance of sanitation and hygienic handling. • Regular cleaning and disinfection of milk containers.
Chilling plants for milk conservation	• Contamination of milk due to poor hygiene practices. • Pollution due to improper disposal of waste water.	• Ensure Location Clearance and Environment Clearance from Department of Environment. • Implementation of prescribed cleaning and disinfection protocol for the Bulk Milk Cooler and the chilling plant. • Ensure effluent treatment and discharge as per plan approved by Department of Environment.
Milk pasteurization	• Contamination of milk due to poor hygiene practices. • Pollution due to improper disposal of waste water.	• Ensure Location Clearance and Environment Clearance from Department of Environment. • Implementation of prescribed cleaning and disinfection protocol for the equipment and the plant. • Ensure effluent treatment and discharge as per plan approved by Department of Environment.
Preparation of indigenous dairy products	• Health risk from poor housekeeping and handling. • Health risk from use of unauthorized additives such as food colourants.	• Ensure Location Clearance and Environment Clearance from Department of Environment. • Regular cleaning and disinfection of the equipment and the plant. • Ensure effluent treatment and discharge as per plan approved by Department of Environment. • Avoid use of unauthorized additives such as food colourants.
Improved small-scale slaughterhouses and dressing houses for safer	• Health risk (zoonotic diseases) from poor housekeeping and	• Ensure that the design of the slaughter house adheres to basic standards including elevated clean floor, drainage system and

Nature of sub-projects to be supported	*Potential negative environmental impacts*	*Mitigation measures*
meat production	handling. • Contamination of meat due to poor hygiene practices. • Pollution due to improper disposal of solid and liquid wastes.	water, roof railings for evisceration, training to butchers on ante-mortem examination for un-healthy animals, hygienic slaughter, meat handling and waste management. • Ensure Location Clearance and Environment Clearance from Department of Environment. • Implementation of prescribed cleaning and disinfection protocol for the equipment and the plant. • Ensure effluent treatment and discharge as per plan approved by Department of Environment.
Input marketing	• Increase in use of chemical inputs in agriculture. • Increase in use of hazardous chemical pesticides. • Risk of trading in banned or sub-standard chemical inputs. • Health risk from poor housekeeping and handling.	• Avoid trading of pesticides that do not meet prescribed quality standards, banned pesticides, and, pesticides in WHO classes IA, IB and II. • Adhere to prescribed procedures for safe storage and handling of pesticides, and for safe disposal of expired pesticides.
Commodity marketing	• Health risk from poor housekeeping and handling.	• Maintenance of sanitation and hygienic handling. • Integrated and safe use of pesticides for pest management.
Marketing facilities for sale of goats	• Health risk (zoonotic diseases) from poor housekeeping and handling.	• Maintenance of sanitation and hygienic handling.

6.5.2 Environmental Enhancement Measures

The NATP-2 includes several activities that will promote better natural resource management and contribute to environmental conservation (examples include fodder cultivation, manure management, etc.). In addition to these activities, a few enhancement measures are suggested, particularly to strengthen the climate adaptation capacity of the small holder livestock sector.

Short-term adaptation practices:

- Spraying water on sheds during high temperatures.
- Use of preventive medication for disease prevention and curative measures during extreme weather conditions.
- Fodder preservation.

Longer-term adaptation measures:

- Emergency response and post-flood rehabilitation program.
- Transfer of small ruminants and poultry from flood and cyclone affected areas to high land.
- Building sheds for poultry/shed management during drought.

- Preparing raised land platforms and sheds.
- Growing salinity tolerant fodder grasses.

6.5.3 Environmental Codes of Practice

The following Codes of Practice will be applicable, as relevant, to all activities supported under the Livestock Development Component of the NATP.

Pesticide use:

Pesticides that fall in the classes IA, IB and II of the World Health Organization's *Recommended Classification of Pesticides by Hazard and Guidelines to Classification* must not be used (e.g., for fodder cultivation). All other pesticides may be used only within the context of an integrated pest management programme.

Occupational health and safety:

All handlers of animals, machinery and chemicals must follow prescribed occupational health and safety practices to prevent spread of zoonotic diseases, injury, toxic poisoning, etc. (e.g., use of pesticides by farmers for fodder cultivation, use of tweezers by CEALs for retrieval of AI ampules from liquid nitrogen cylinders, etc.).

Waste disposal:

- *Farm waste disposal*: All organic farm waste (dung, urine, left over fodder, etc.) is to be composted (or sold for composting) through improved composting methods.
- *Processing plant waste disposal*: All solid and liquid wastes generated from food processing plants (milk, meat, etc.) are to be disposed as per the prescribed standards of the Government of Bangladesh and as per the global best practice (this includes wastes from milk chilling plants, milk products manufacturing plants, slaughter houses, etc.).
- *Laboratory waste disposal*: All chemical and biomedical wastes are to be disposed as per the prescribed standards of the Government of Bangladesh and as per the global best practice. Biomedical waste has to be subjected to thermal destruction through incineration or autoclaving prior to disposal. Chemical waste is to be disposed as per the instructions provided in the respective chemical Material Safety Data Sheets (MSDS) data sheets.

Feed and food safety:

All feed and food products must adhere to the standards prescribed by the Government of Bangladesh for feed and food safety. Additives such as steroids, dyes, etc., that have been banned or are being phased out either in Bangladesh or internationally must not be used.

Water quality and conservation:

All water sources utilized for livestock production and product processing must meet the minimum quality standards prescribed by the Government of Bangladesh. All groundwater utilized for fodder production and product processing must be used in a manner that promoted efficient use and conservation.

Construction practices:

All construction activities must incorporate standards for public and worker safety prescribed by the Government of Bangladesh (e.g., use of protective gear by

construction workers, fencing off construction sites to prevent unauthorized public access, rehabilitation of borrow pits, compensatory plantation for any felled trees, etc.).

Compliance with environment conservation regulations:
All enterprises including dairy farms, SMEs involved in feed and food (milk, meat, etc.) processing, slaughter houses, etc. must comply with the Location Clearance and Environmental Clearance requirements of the Government of Bangladesh.

6.5.4 Environmental Monitoring Plan

The effectiveness of implementation of this EMF depends to a large extent on the implementation support provided at various levels. Monitoring to identify and suitably address any issues is thus important. Two types of monitoring will be implemented: i) sub-project environmental effect monitoring and ii) environmental impact monitoring. Figure 6-2 shows the flow diagram of environmental monitoring system in NATP-2. Effect monitoring of technology demonstration sub-projects as well as monitoring of research and value chains will be on annual basis. The monitoring plan of livestock development component is outlined in Table 6-3 and monitoring formats are presented in Annexes 7 to 12.

Figure 6-2: Environmental Monitoring Plan in Livestock Development Component of NATP-2

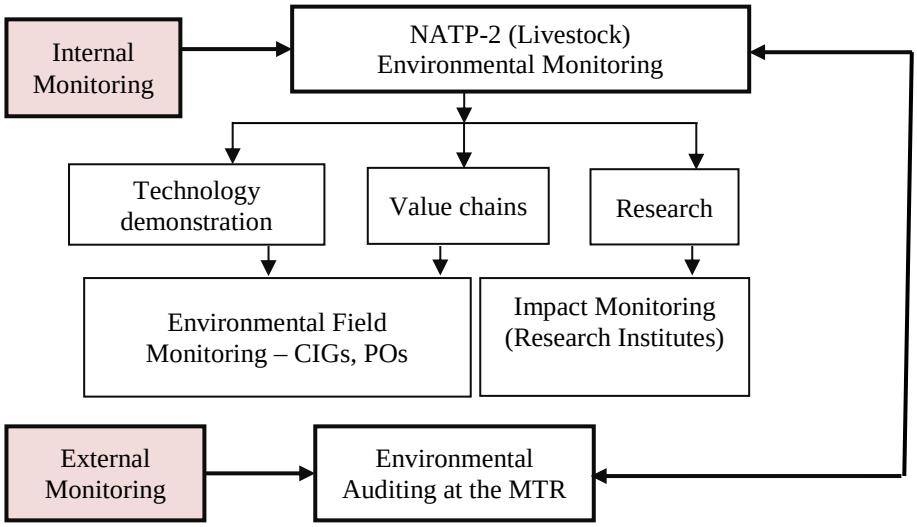


Table 6-3: Monitoring plan for Livestock Development Component of NATP-2

Level	*Monitoring Responsibility*	*Monitoring Focus*	*Monitoring Methodology*	*Monitoring Frequency*
Union	Community Extension Agents for Livestock (CEAL)	Monitoring implementation of mitigation measures, Environmental Codes of Practice, Enhancement Measures	Field visits to every CIG, PO	Monthly
Upazila	Upazila Livestock Officer	Monitoring implementation of mitigation measures, Environmental Codes of Practice, Enhancement	Field visits to every CIG, PO	Quarterly

Level	*Monitoring Responsibility*	*Monitoring Focus*	*Monitoring Methodology*	*Monitoring Frequency*
		Measures		
District	District Livestock Officer	Environmental Screening and Assessment	Desk review of sub-project proposals	On-going
		Monitoring implementation of mitigation measures, Environmental Codes of Practice, Enhancement Measures	Field visits to sample of CIG, PO	Six-monthly
National	Focal Point for Environmental Safeguards in PIU-DLS	Environmental Screening and Assessment	Desk review of sample of sub-project proposals	Quarterly
		Monitoring implementation of mitigation measures, Environmental Codes of Practice, Enhancement Measures	Field visits to sample of CIG, PO; Visits to subproject proponent institutions (supported for research and institutional capacity building)	Six-monthly

6.5.5 External Environmental Audit

The PIU will hire an independent consultant agency to undertake an external environmental audit of the project. This audit will be undertaken prior to the mid-term review so that environmental assessment and monitoring system for the livestock component can be improved. The Terms of Reference for this audit are provided in Annex 14.

6.5.6 Institutional Arrangements

The key roles and responsibilities on environmental management are described in the Table 6-4.

Table 6-4: Roles and Responsibilities on Environmental Management in the Livestock Development Component of NATP-2

Level	*Role*	*Responsibility*
Union	Community Extension Agents for Livestock (CEAL)	Provide technical support to CIGs and POs on implementation of mitigation measures, Environmental Codes of Practice and Enhancement Measures. Conduct environmental awareness and training for the CIGs, POs.
Upazila	Upazila Livestock Officer (ULO)	Undertake environmental categorization of all CIG, PO and SME sub-projects. Undertake LEA of low impact sub-projects. Coordinate the functioning of the CEALs. Monitor the implementation of mitigation measures, Environmental Codes of Practice and Enhancement Measures.
District	District Livestock Officer (DLO)	Monitor the implementation of mitigation measures, Environmental Codes of Practice and Enhancement Measures. Coordinate and support the Upazila Livestock Officer in implementation of the EMF.

Level	*Role*	*Responsibility*
National	Focal Point for Environmental Safeguards in PIU-DLS	Review environmental documentation in sub-project proposals to ensure that the prescribed environmental management practices (as described in this EMF) are implemented. Ensure that excluded activities are not financed. Provide assistance to district and upazila level staff in undertaking environmental screening and assessment of CIG, PO sub-projects. Verify sub-project environmental categorization. Provide assistance to subproject proponent institutions (supported for research and institutional capacity building) in determining environmental issues, identifying and implementing actions from the Environmental Code of Practices, filling out required documentation, etc. Conduct Detailed Environmental Assessment. Conduct formal and on the job training for CEAL, ULO and DLO.

6.5.7 Capacity Building

The environmental soundness of the interventions supported under the NATP depend to a large extent on the capacity of the beneficiary communities and line department staff to identify and suitably address any environmental impacts, and, to actively promote better environmental management.

The plan for capacity building of the communities and line department staff is outlined in Table 6-5.

Table 6-5: Capacity Building Plan for Livestock Development Component of NATP-2

Level	*Trainee Profile*	*Training Focus*	*Key Training Methodology*	*Training Frequency*	*Training Duration*
Community	CIGs, POs, SMEs	Environmental awareness programme for all CIGs, POs and SMEs on themes including: • Environmental Codes of Practice • Fodder management • Manure management • Climate adaptation • Food Safety	Community video and discussion	Prior to sub-project proposal preparation	Half day
		Sub-project specific, skill-based training on implementation of mitigation measures to be organized for every CIG, PO. The themes include: • Environmental Codes of Practice • Fodder management • Manure management • Climate adaptation • Food Safety	Exposure visits; Demonstration units; Hands-on sessions	Prior to initiation of sub-project implementation	2 days

Union	Community Extension Agents for Livestock (CEAL)	Sub-project specific, skill-based training on environmental management (mitigation measures, Environmental Codes of Practice, Enhancement Measures)	Class-room sessions; Exposure visits; Hands-on sessions	Six-monthly	2 days
Upazila	Upazila Livestock Officer	Environmental Screening and Assessment	Class-room sessions; Exposure visits; Hands-on sessions	Six-monthly	2 days
District	District Livestock Officer	Overview of the Environmental Management Framework for the NATP	Class-room sessions; Exposure visits	Annual	1 day

6.5.8 Budget

The budget for implementation of the EMF for the livestock component of the NATP-2 is outlined in Table 6-6.

Table 6-6: Budget for Livestock Development Component of NATP-2

Sl.	*Livestock*	*Unit*	*Cost per unit (BDT)*	*No. of units*	*Total*
1	Capacity Building				
	Environmental awareness programme for 8171 CIGs, POs, SMEs	Batch	10000	163	1634200
	Sub-project specific skill based training for 8171 CIGs, POs, SMEs	Batch	30000	163	4902600
	Sub-project specific skill based training for 2700 CEALs	Batch	30000	540	16200000
	Training on Environmental Screening and Assessment for 270 ULOs	Batch	50000	54	2700000
	Orientation on EMF for DLOs	Batch	10000	1	10000
2	External Environmental Audit	Study	1000000	1	1000000
	Total				26446800

6.5.9 Construction and Civil Works

All construction activities must incorporate standards for public and worker safety prescribed by the Government of Bangladesh (e.g., use of protective gear by construction workers, fencing off construction sites to prevent unauthorized public access, rehabilitation of borrow pits, compensatory plantation for any felled trees, etc.). Annex 15 describes the special environmental clauses for tender documents.

6.6 Review and Approval

After receiving the completed Environment Screening, LEA or DEA report of the selected sub-project, the PIU Environment Safeguards Specialist will assess the adequacy of the mitigation measures and EMP. This assessment will be conducted through desk review and field visits and concentrated on the quality of the baseline

information, identification of potential impacts, effectiveness and the adequacy of the mitigation measures, and monitoring plan. This report will be submitted to the PD for approval and further action.

6.7 Compliance Check by IDA

MoA will seek concurrence of the World Bank Team in view of their compliance with environment guidelines. IDA can ask for further clarification for strengthening the environmental documentation. In that case, MoA will take necessary action to improve or revise the document and resubmit to the IDA for re-examination.

7 Environment Management Process for Fisheries Development

This section describes the general guidelines for mainstreaming the environmental considerations in different activities of Fisheries Development component of NATP-2 including research and value chain development. It also provides necessary tools for screening or assessing environmental impacts. The environmental assessment of the NATP-2 sub-projects is to be carried out following the provisions of the Environment Conservation Rules 1997 and the relevant World Bank Operational Policies (OP 4.01 Environmental Assessment). Following sections discuss the overall process of environmental management to be followed in this component. A process flow diagram showing planning and implementation of sub-projects and various phases of environmental management process has been illustrated in Figure 7-1.

7.1 Environmental Management

The following principles will be followed in the overall environmental management of sub-projects to be implemented under the Fisheries Development component of the NATP-2:

- Activities with severe negative environmental impacts will not be supported by NATP-2.
- Activities involving financing of CIGs, POs, SMEs will go through environmental screening and assessment and will have sub-project specific Environmental Management Plans (EMPs).
- All supported activities will ensure compliance with the relevant 'Environmental Codes of Practice'.
- 'Environmental Enhancement Measures' will be recommended specifically to address adaptation needs in the context of climate change.

The following steps or ***supporting elements*** ensure systematic implementation of the system for environmental management:

- Reviewing negative list of attributes
- Categorization of sub-projects
- Environment assessment of sub-projects and development of EMP
- Institutional arrangements
- Capacity building
- Monitoring
- External Environmental Audit

7.2 List of Negative Attributes and Sub-projects

The following activities will not be supported under the NATP-2:

- Activities that involve pesticides that fall in WHO classes IA, IB and II and pesticides banned by the Government of Bangladesh.
- Activities involving significant conversion or degradation of critical natural habitats (mangroves).
- Activities within Protected Areas (Wildlife Sanctuaries and National Parks).
- Activities that involve Genetically Modified Organisms (GMOs) that have not been approved by an independent panel of internationally recognized experts, and cleared by the World Bank.

7.3 Categorization of Sub-projects

NATP-2 will fund various sub-projects / activities under the Fisheries Development component that coves research, technology demonstration (extension), and value chain development. The possible sub-projects to be funded under the NATP-2 have been categorized on the basis of the level of environmental assessment they need to go through. This categorization is provided in Table 7-1.

Table 7-1: Categorization of Sub-projects in Fisheries Sector based on EA requirement

Specific Interventions	*Sub project*	*Major Negative Impacts*	*DEA Categorization*	*NATP Categorization based on EA requirement*
Promote productivity through an integrated approach	Specific fish production models	Water pollution due to use of pellet feed, chemicals etc. Loss of local fish diversity	Not Specified	LEA
	Quality fish seed	Pollution due to use of pellet feed, antibiotics, chemicals etc.	Not Specified	LEA
	Quality fish feed	Chemical residues in ingredients, unsafe storage etc.	Not Specified	LEA
	Application of fisheries management tools	Nil	Not Specified	None
Semi intensive fish production models to promote productivity and profitability	Genetically Improved Farm (GIF) Tilapia monoculture	Water pollution due to use of pellet feed, chemicals etc. Loss of local fish diversity	Not Specified	LEA
	GIF Tilapia polyculture	Water pollution due to use of pellet feed, chemicals etc. Loss of local fish diversity	Not Specified	LEA
	Pangas polyculture	Water pollution due to use of pellet feed, chemicals etc. Loss of local fish diversity	Not Specified	LEA
	Freshwater prawn polyculture	Water pollution due to use of pellet feed, chemicals, antibiotics etc. Loss of local fish diversity	Not Specified	LEA
	Koi polyculture	Water pollution due to use of pellet feed, chemicals etc. Loss of local fish diversity	Not Specified	LEA
	Carp polyculture	Water pollution due to use of pellet feed, chemicals etc. Loss of local fish diversity	Not Specified	LEA

Specific Interventions	*Sub project*	*Major Negative Impacts*	*DEA Categorization*	*NATP Categorization based on EA requirement*
Assured supply of quality fish seed	Fish seed of GIF tilapia	Water pollution due to use of pellet feed, chemicals etc. Loss of local fish diversity.	Not Specified	LEA
	Stock improvement of climbing perch and Thai pangas	Water pollution due to use of pellet feed, chemicals etc. Loss of local fish diversity	Not Specified	LEA
Formulated fish feed with local ingredients	Fish feed preparation units	Chemical residues in ingredients affecting feed quality, dust emissions during preparation, unsafe storage leading to pest, mold infestation, etc.	Orange B	DEA
Promotion of climate resilient innovative technologies	Use of short seasonal water bodies	Loss of fish diversity due to introduction of new species, water pollution due to feed application in excess quantities	Not Specified	LEA
	Tolerant species in saline areas	Loss of fish diversity due to introduction of new species, water pollution due to feed application in excess quantities	Not Specified	LEA
	Innovations like cage fish culture, pen farming in open water		Not Specified	LEA
Increasing local extension agents	Recruitment, training programmes	Nil	Not Specified	None
Promoting farmer to farmer extension	Training programmes	Nil	Not Specified	None
Strengthening research extension linkage	Outreach programmes	Nil	Not Specified	None
Investment in development and enhancement of value chains	Improvement and management of fish marketing infrastructure	Local resource use during construction – water, soil etc. Loss of vegetation. Disposal of construction waste etc. Pollution in the surroundings due to disposal of fish waste, drainage problems due to water, bad odour etc.	Not Specified	DEA
	Preservation of fish	use of chemicals like formalin for preserving	Orange B	DEA

Specific Interventions	*Sub project*	*Major Negative Impacts*	*DEA Categorization*	*NATP Categorization based on EA requirement*
		wet fish, use of pesticides for storage of dry, salted fish		
	Setting up cold storage structures	Issues during construction – local resource use, waste disposal etc. High energy requirement for running cold storage, waste water and waste disposal	Orange B	DEA
	Setting up small ice plants	Local resource use and pollution during construction – disposal of debris, loss of vegetation soil etc. Use of low quality water for making ice spoiling the fish, open disposal of ice contaminated with fish slime leading to health issues. High energy requirement for running the plants.	Orange B	DEA
	Food safety and feed quality	Use of harmful chemicals, toxic dyes in preservation of fish. Practice of not washing fish at different stages leading to bacterial growth. Disposal of waste water.	Orange B	DEA
Institutional capacity enhancement for quality control	Training programmes	Nil	Not specified	None

7.4 Environmental Assessment of Fisheries Technology Demonstration & Value Chains

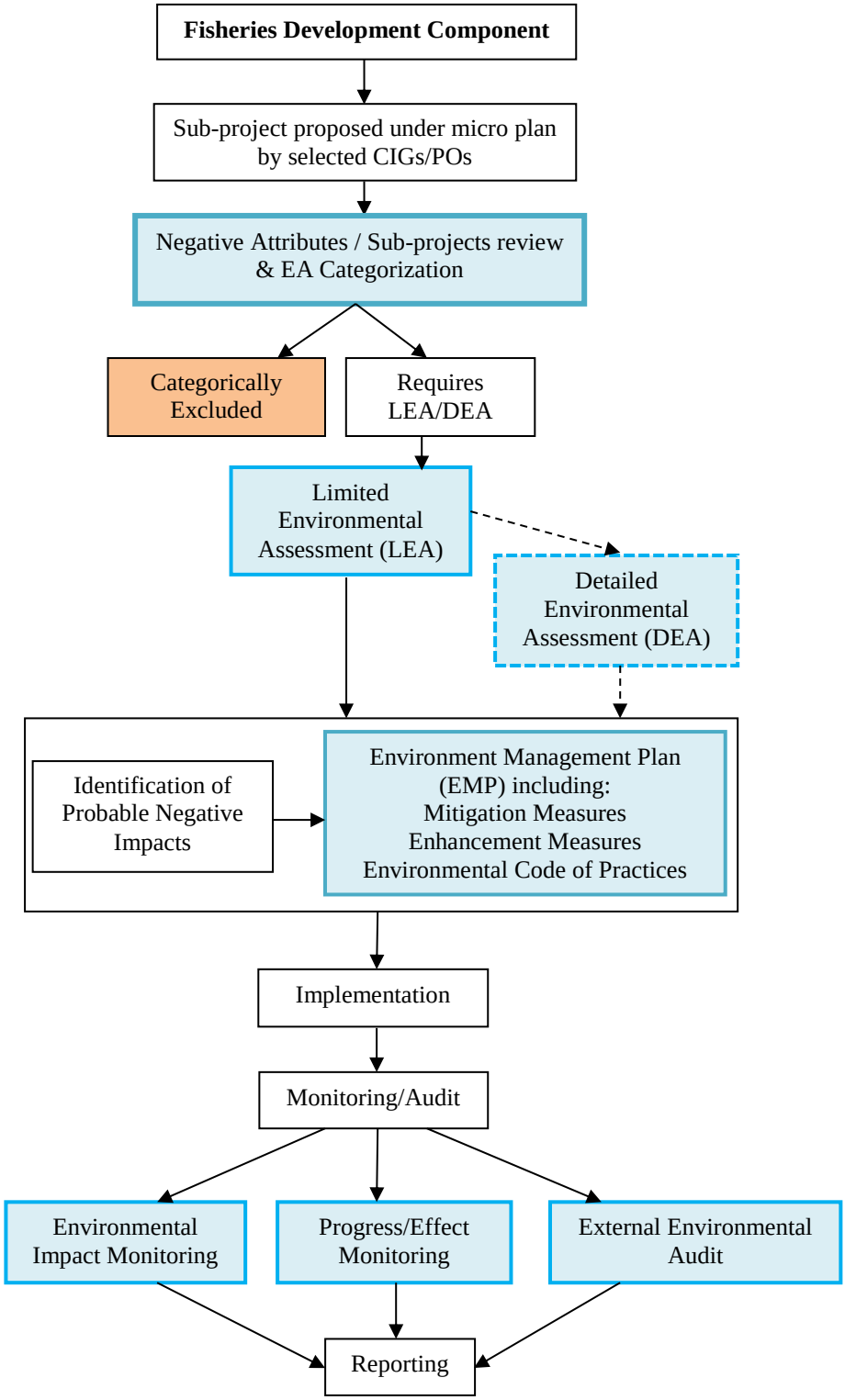
Environmental Assessment is undertaken to identify the possible impacts and required mitigation measures for a sub-project. In NATP-2 selection of sub-projects on fisheries research, technology demonstration and value chains will follow a two step environmental assessment process.

- **Limited Environmental Assessment (LEA):** This level of environmental assessment is for those sub-projects that have relatively limited, localized and reversible environmental impacts and are classified as Green or Orange-A by the Department of Environment. The Table 7-1 outlines the category of activities/sub-projects that will require LEA. The LEA is carried out by the

Upazila Fisheries Officer (UFO) and proponent of research proposals. The LEA formats to be used for fisheries demonstration and value chains development by CIG and POs are provided in Annex 4. Research concept notes (CN) will go through an environment screening using a list of exclusion criteria. The format for environmental screening of research proposals is attached in Annex 5. CNs that are eligible for funding will carry out Limited Environmental Assessment on the full proposal. The LEA format for research proposals has been provided in Annex 6.

- **Detailed Environmental Assessment (DEA):** This level of environmental assessment is for those sub-projects that have relatively significant, large scale and/or irreversible environmental impacts and are classified as Orange-B or Red by the Department of Environment. If LEA recommends carrying out further assessment for any sub-projects where environmental problems are complex and will have cumulative impacts and mitigation measures are not easily available, then DEA can be conducted. The DEA is carried out by the safeguard specialist to be based at the PIU. The outline to be used for DEA is provided in Annex 13.

Figure 7-1: Environmental Management Process in Fisheries Development Component of NATP-2



7.5 Environmental Management Plan (EMP)

The outcome of the environmental assessment will be a Sub-project Environmental Management Plan (EMP).

Following the LEA, the Upazila Fisheries Officer will prepare an EMP that will become an integral part of the sub-project proposal. The EMP will identify the technical and financial support required to implement the necessary mitigation measures. The technical support required by the CIGs, POs and SMEs to implement the mitigation measures will form part of the Upazila Extension Plan. The financial support required to implement the mitigation measures will be included in the sub-project cost. The format for the EMP for Low Impact Activities is included in Annex 4.

The major components of an EMP include: mitigation measures, enhancement measures, ECoPs, estimation of cost of EMP, environmental monitoring, and institutional arrangement for implementation of EMP. The Table 7-2 shows environmental impacts and potential mitigation measures to be recommended in the NATP-2. The EMP consists of the following components:

1. Environmental Mitigation Measures
2. Environmental Enhancement Measures
3. Environmental Code of Practices
4. Environmental Monitoring and Audit
5. Institutional Arrangements
6. Capacity Building Plan
7. Budget for implementation of EMP

7.5.1 Environmental Mitigation Measures

Most of the negative impacts that may occur through the implementation of NATP-2 sub-projects can be easily mitigated. The Table 7-2 shows the list of mitigation measures suggested for sub-projects to be implemented under the fisheries development component of NATP-2. This list of potential impacts and mitigation measures will guide the LEA and DEA.

Table 7-2: Environmental impacts and mitigation measures for sub-projects

Nature of sub-projects to be supported	*Potential negative environmental impacts*	*Mitigation measures*
Productivity enhancement through integrated approach	Introducing improved varieties of fish in local ponds would affect the fish diversity. Use of fish feed pellets or chemical fertilizers in the water bodies lead to alteration of water quality, salinity and affects aquatic life especially when used in excess.	Selection of varieties that does not pose threat to local species. Use natural feeds like rice bran and natural fertilizers like cow dung to the extent possible. Usage should be according to recommended doses.
Semi intensive fish production models with species like – Tilapia under monoculture, poly culture	Fish like Tilapia due to omnivorous nature can predate on small fish of native species. Tilapia fish multiplies fast and may suppress aquatic diversity. Excessive manuring leads to eutrophication and acidification.	Species selection in polyculture should be as per recommendation of the DOF – and designed to avoid competition with other species and aquatic life. Use manure in recommended doses.
Promotion of climate resilient technologies.	No considerable negative impact.	Care should be taken in cage culture to avoid disease outbreak.

Nature of sub-projects to be supported	*Potential negative environmental impacts*	*Mitigation measures*
Use of short seasonal water bodies, use of salt tolerant species and cage fish and pen culture		
Fish seed farms	Fish seed farm which requires intensive chemical inputs for fertilization and disease control; and pellet feeding alter the quality of water – especially when used in excessive quantities.	Use of permitted chemicals and antibiotics in recommended doses.
Supply of formulated fish feed with local ingredients	Setting up feed units without license is illegal. Running of feed mills needs high energy use. Feed mills may cause noise and dust pollution. Not using approved feed ingredients may lead to water quality alteration and affect on fish health. Improper storage without moisture regulation may cause spoilage due to mold and pest infestation. Improper storage may require use of pesticides to control pest infestation.	Ensure Location Clearance and Environment Clearance from Department of Environment. All feed producers should obtain required registration and license. Precautions to be taken to avoid negative impacts on surrounding environment. Renewable energy options could be explored for running the mills. Approved ingredients that meet prescribed quality standards should be used in manufacture of feed. Use of local feed material should be encouraged (for example, bran, soybean, maize, mustard oil cake, dried duck weed, poultry viscera, dry animal waste from slaughter houses, shrimp heads, etc. may be used in Tilapia feed). Feed should be dried well and stored 10-15 cm above ground level. Feed packaging should be insect proof.
Investment in development of value chains infrastructure – ice making units, market yards, cold storage and processing	Construction activities may involve clearing of vegetation, improper disposal of debris, etc. Wastes may not be disposed off properly leading to health risk and pollution. Waste water and ice may contaminate the surrounding water bodies. High energy requirement for cold storage. Use of unclean water in ice making units will spoil the quality of fish. Use of chemicals like formaldehyde for storage of fish is highly hazardous to human health. Use of toxic dyes like auramine, rhodamine B, malachite green, yellow G, allura red and chrysoidine (for giving fresh appearance to fish) is hazardous to health. Improper preservation or washing before preservation spoils the fish	Ensure Location Clearance and Environment Clearance from Department of Environment. Select location so as to avoid cutting trees, ensure safe disposal of debris, etc. All wastes should be disposed off properly. Alternate uses of fish waste like use for preparation of fish meal or composting should be explored. Waste water should be treated to prescribed standards and disposed at permissible receptacles. Care should be taken to avoid contamination of water bodies. Use of renewable resources of energy should be explored. Clean water that meets prescribed standards should be used for ice making. Use of formaldehyde or any other chemicals for preservation should be avoided. No dyes should be used.

Nature of sub-projects to be supported	*Potential negative environmental impacts*	*Mitigation measures*
	quality. In case of dry fish, application of slat with bare hands will lead to skin problems. Open drying of fish may get contaminate the product with insects, dirt, etc.	Fish should be washed well at every step in preservation. Workers handling preservation should follow prescribed hygiene measures. Protective gear should be used for application of salt. After removing the gut contents, the fish can be washed with chlorinated water to avoid spoilage. For fish drying explore the use of solar driers or dry on strings or on clean surfaces like cement platforms, clean bamboo mats, etc.

7.5.2 Environmental Enhancement Measures

The NATP-2 includes several activities that will promote better natural resource management and contribute to environmental conservation (an example is integrated fisheries culture). In addition to these activities, a few enhancement measures are suggested, particularly to strengthen the climate adaptation capacity of the small holder fisheries sector.

Fish culture: Promotion of organic farming and use of native fish species, with certification of produce and premium marketing, could be promoted.

Value chain activities: Use of energy efficient machinery and renewable energy resources could be promoted for processing and value addition to the extent possible (for example, use of solar driers).

Climate Change Adaptation: The following measures could be promoted for climate adaptation in the fisheries sector:

- Raising pond embankments
- Net fencing of ponds
- Harvesting fish before drought
- Advance selling
- Binding boats and nets with trees
- External water supply (for commercial farming)
- Creating aquatic vegetation as shelter in ponds
- Silt removal from the ponds, tanks
- Preparing water reservoirs
- Changing species to suit to changing climate
- Introduction of saline tolerant species
- Establishment of fish sanctuary for increased seed production

7.5.3 Environmental Codes of Practice

The following Codes of Practice will be applicable, as relevant, to all activities supported under the Fisheries Development Component of the NATP.

Water resources:

Fish farms shall not obstruct/interfere with any flowing canal.

Only surface water shall be used for pond construction. Underground water shall not be drawn for fish farming purpose. Saline water shall not be allowed to seep into neighboring agricultural lands.

Pollution:

Fish farms should be located in areas where the risk of contamination by chemical, physical or microbiological hazards is minimal and where sources of pollution can be controlled.

Ponds should have separated inlets and discharge canals so that water supplies and effluent are not mixed.

Adequate facilities for the treatment of effluent to prescribed standards should be provided and sufficient time allowed for sediments and organic load settlement before used and treated water is discharged into the permissible receptacle water body.

Farming practices:

Good water quality should be maintained by using stocking and feeding rates that do not exceed the carrying capacity of the culture system.

Stocking densities should be based on culture techniques, fish species, size and age, carrying capacity of the fish farm, anticipated survival and desired size at harvesting.

Diseased fish should be quarantined when necessary and appropriate; dead fish should be disposed off immediately in a sanitary manner that will discourage the spread of disease.

Banned antibiotics, drugs and other chemical compounds shall not be used in fish farming.

Feed or feed ingredients that are not certified by the manufacturers to be free from non-approved antibiotics, drugs or other chemicals including artificially formulated growth hormones shall not be used (procuring safe feed is the responsibility of the farm operator).

Any oversupply of feed shall be strongly discouraged to avoid water pollution and wastage.

Natural habitats:

Fish farms and feed mills shall not occupy any part of common property wetlands.

Avoid semi-intensive or intensive fish farming near mangroves.

Feed mill construction and operations shall not cause any harm to mangroves. Feed mills shall not cause any threat to wetlands from factory effluents.

Fish feed units:

For fish feed units, a no-objection certificate (NOC) must be issued by the Department of Fisheries. The NOC is also required for import of blood meal and bone meal for fish feed. The unit should comply with quality control checks by the Department.

Feed mills shall not use any prohibited antibiotics, growth hormones, steroids, pesticides or any other hazardous chemicals in the feed or feed ingredients, nor shall it use any feed ingredients already contaminated elsewhere with the above materials.

Feed mill shall not use shrimp, crab or other crustacean shell as a feed ingredient, since the crustacean shell is likely to contain high levels of nitrofurans, a group of prohibited antibiotics.

Feed mills shall not pollute or disturb the neighboring environment or any part of the ecosystem

Ice making units:
Ice making units must follow prescribed procedures and standards of hygiene and cleanliness.
Ice plants shall not use any bamboo baskets or jute mats for storage or packaging of ice.
Ice must be carried in refrigerated / insulated/ covered carriers.
All workers and visitors must disinfect their feet in foot-dip (200 ppm chlorine) and hands at the hand washing basins before entering the ice production and handling areas.
No person with any contagious or communicable disease or wounds on hands should be allowed to handle ice or fish.
Code of practice for ice manufacture and standards for icing of fish prescribed for each species should be followed.
All stakeholders including fishers, retailers/vendors should be trained on fish handling and icing practices.

Fish processing:
Standards and codes of practice for fish drying, salting, smoking and fermentation should be developed and followed in line with those prescribed by the Government of Bangladesh and the *FAO Codex Alimentarius Commission*.
Banned chemicals and toxic dyes must not be used.
Workers handling the fish should posses a valid health certificate.
All workers should be trained in handling practices.
The wastes should be treated to meet prescribed standards prior to release to permissible receptacles.

Construction practices:
All construction activities must incorporate standards for public and worker safety prescribed by the Government of Bangladesh (e.g., use of protective gear by construction workers, fencing off construction sites to prevent unauthorized public access, rehabilitation of borrow pits, compensatory plantation for any felled trees, etc.).

7.5.4 Environmental Monitoring Plan
The effectiveness of implementation of this EMF depends to a large extent on the implementation support provided at various levels. Monitoring to identify and suitably address any issues is thus important. Two types of monitoring will be implemented: i) sub-project environmental effect monitoring and ii) environmental impact monitoring. Figure 7-2 shows the flow diagram of environmental monitoring system in NATP-2. Effect monitoring of technology demonstration sub-projects as well as monitoring of research and value chains will be on annual basis. The monitoring plan of fisheries development component is outlined in Table 7-3 and monitoring formats are presented in Annexes 7 to 12.

Figure 7-2: Environmental Monitoring Plan in Fisheries Development Component of NATP-2

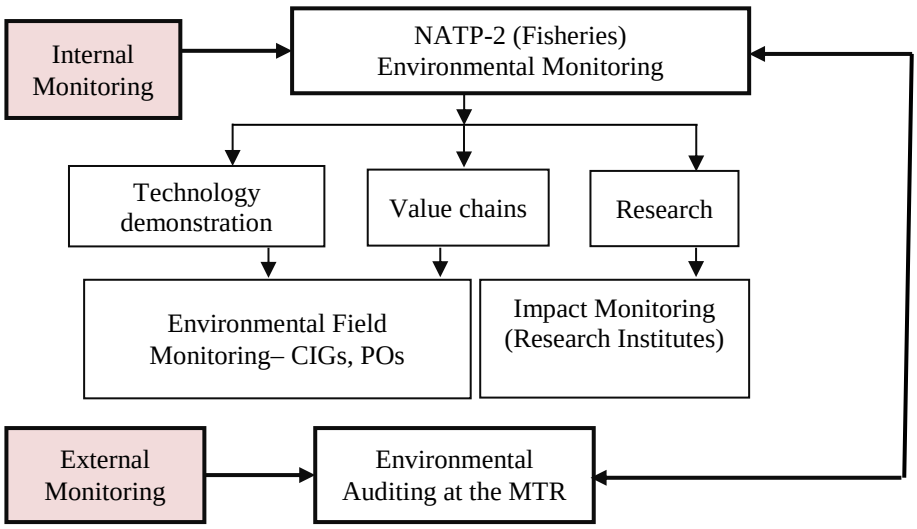


Table 7-3: Monitoring plan for Fisheries Development Component of NATP-2

Level	*Monitoring Responsibility*	*Monitoring Focus*	*Monitoring Methodology*	*Monitoring Frequency*
Union	Local Extension Agent for Fisheries (LEAF)	Monitoring implementation of mitigation measures, Environmental Codes of Practice, Enhancement Measures	Field visits to every CIG, PO	Monthly
Upazila	Upazila Fisheries Officer	Monitoring implementation of mitigation measures, Environmental Codes of Practice, Enhancement Measures	Field visits to every CIG, PO	Quarterly
District	District Fisheries Officer	Environmental Screening and Assessment	Desk review of sub-project proposals	On-going
		Monitoring implementation of mitigation measures, Environmental Codes of Practice, Enhancement Measures	Field visits to sample of CIG, PO	Six-monthly
National	Focal Point for Environmental Safeguards in PIU-DLS	Environmental Screening and Assessment	Desk review of sample of sub-project proposals	Quarterly
		Monitoring implementation of mitigation measures, Environmental Codes of Practice, Enhancement Measures	Field visits to sample of CIG, PO; Visits to subproject proponent institutions (supported for research and institutional capacity building)	Six-monthly

7.5.5 External Environmental Audit

The PIU will hire an independent consultant agency to undertake an external environmental audit of the project. This audit will be undertaken prior to the mid-term review so that environmental assessment and monitoring system for the fisheries component can be improved. The Terms of Reference for this audit are provided in Annex 14.

7.5.6 Institutional Arrangements

The key roles and responsibilities on environmental management are described in the Table 7-4.

Table 7-4: Roles and Responsibilities on Environmental Management

Level	*Role*	*Responsibility*
Union	Local Extension Agent for Fisheries (LEAF)	Provide technical support to CIGs, POs and SMEs on implementation of mitigation measures, Environmental Codes of Practice and Enhancement Measures. Conduct environmental awareness and training for the CIGs and POs.
Upazila	Upazila Fisheries Officer (UFO)	Undertake environmental screening of all CIG, PO sub-projects. Undertake LEA of sub-projects. Coordinate the functioning of the LEAFs. Monitor the implementation of mitigation measures, Environmental Codes of Practice and Enhancement Measures.
District	District Fisheries Officer (DFO)	Monitor the implementation of mitigation measures, Environmental Codes of Practice and Enhancement Measures. Coordinate and support the UFOs in implementation of the EMF.
National	Focal Point for Environmental Safeguards in PIU-DLS	Review environmental documentation in sub-project proposals to ensure that the prescribed environmental management practices (as described in this EMF) are implemented. Ensure that excluded activities are not financed. Provide assistance to district and upazila level staff in undertaking environmental screening and assessment of CIG, PO sub-projects. Verify sub-project environmental categorization. Provide assistance to subproject proponent institutions (supported for research and institutional capacity building) in determining environmental issues, identifying and implementing actions from the Environmental Code of Practices, filling out required documentation, etc. Conduct Detailed Environmental Assessment. Conduct formal and on the job training for LEAF, UFO and DFO.

7.5.7 Capacity Building

The environmental soundness of the interventions supported under the NATP depend to a large extent on the capacity of the beneficiary communities and line department staff to identify and suitably address any environmental impacts, and, to actively promote better environmental management.

The plan for capacity building of the communities and line department staff is outlined in Table 7-5.

Table 7-5: Capacity Building Plan for Fisheries Development Component of NATP-2

Level	*Trainee Profile*	*Training Focus*	*Key Training Methodology*	*Training Frequency*	*Training Duration*
Community	CIGs, POs, SMEs	Environmental awareness programme for all CIGs, POs on themes including: • Environmental Codes of Practice • Climate adaptation • Food Safety	Community video and discussion	Prior to sub-project proposal preparation	Half day
		Sub-project specific, skill-based training on implementation of mitigation measures to be organized for every CIG, PO. The themes include: • Environmental Codes of Practice • Climate adaptation • Food Safety	Exposure visits; Demonstration units; Hands-on sessions	Prior to initiation of sub-project implementation	2 days
Union	Local Extension Agent for Fisheries (LEAF)	Sub-project specific, skill-based training on environmental management (mitigation measures, Environmental Codes of Practice, Enhancement Measures)	Class-room sessions; Exposure visits; Hands-on sessions	Six-monthly	2 days
Upazila	Upazila Fisheries Officer	Environmental Screening and Assessment	Class-room sessions; Exposure visits; Hands-on sessions	Six-monthly	2 days
District	District Fisheries Officer	Overview of the EMF for the NATP	Class-room sessions; Exposure visits	Annual	2 days

7.5.8 Budget

The budget for implementation of the EMF for the livestock component of the NATP-2 is outlined in Table 7-6.

Table 7-6: Budget for Livestock Development Component of NATP-2

Sl.	*Fisheries*	*Unit*	*Cost per unit (BDT)*	*No. of units*	*Total*
1	Capacity Building				
	Environmental awareness programme for 6770 CIGs, POs, SMEs	Batch	10000	135	1354000
	Sub-project specific skill based training for 6770 CIGs, POs, SMEs	Batch	30000	135	4062000
	Sub-project specific skill based training for 3385 LEAFs	Batch	30000	677	20310000
	Training on Environmental Screening and Assessment for 270 UFOs	Batch	50000	54	2700000
	Orientation on EMF for DFOs	Batch	10000	1	10000
2	External Environmental Audit	Study	500000	1	500000
	Total				24436000

7.5.9 Construction and Civil Works

All construction activities must incorporate standards for public and worker safety prescribed by the Government of Bangladesh (e.g., use of protective gear by construction workers, fencing off construction sites to prevent unauthorized public access, rehabilitation of borrow pits, compensatory plantation for any felled trees, etc.). Annex 15 describes the special environmental clauses for tender documents.

7.6 Review and Approval

After receiving the completed Environment Screening, LEA or DEA report of the selected sub-project, the PIU Environment Safeguards Specialist will assess the adequacy of the mitigation measures and EMP. This assessment will be conducted through desk review and field visits and concentrated on the quality of the baseline information, identification of potential impacts, effectiveness and the adequacy of the mitigation measures, and monitoring plan. This report will be submitted to the PD for approval and further action.

7.7 Compliance Check by IDA

MoA will seek concurrence of the World Bank Team in view of their compliance with environment guidelines. IDA can ask for further clarification for strengthening the environmental documentation. In that case, MoA will take necessary action to improve or revise the document and resubmit to the IDA for re-examination.

8 Environment Management Process for Agricultural Technology Generation

This section describes the general guidelines for mainstreaming the environmental considerations in the various decentralized, demand-driven research activities to be supported under the component 1 of NATP-2 on enhancing the agricultural technology generation (covering crop, livestock and fisheries sectors). It also provides necessary tools for screening or assessing environmental impacts of the supported activities. The environmental assessment of the activities is to be carried out following the provisions of the Environment Conservation Rules 1997 and the relevant World Bank Operational Policies (OP 4.01 Environmental Assessment and OP 4.09 Pest Management). Following sections discuss the overall process of environmental management to be followed in this component. A process flow diagram showing planning and implementation of sub-projects and various phases of environmental management process has been illustrated in Figure 5-1.

8.1 Environmental Management

The following principles will be followed in the overall environmental management of sub-projects to be implemented under the Enhancing the Agricultural Innovation System component of NATP-2:

- Research activities with severe negative environmental impacts will not be supported by NATP-2.
- Research proposals will go through environmental screening and assessment and will have sub-project specific Environmental Management Plans (EMPs).
- All supported research sub-projects will ensure compliance with the relevant 'Environmental Codes of Practice'.
- 'Environmental Enhancement Measures' will be recommended specifically to utilize opportunities for enhancing environmental benefits from the proposed research sub-projects.

The following steps or ***supporting elements*** ensure systematic implementation of environmental management:

- Reviewing negative list of attributes
- Categorization of research sub-projects
- Environment assessment of research sub-projects and development of EMP
- Institutional arrangements
- Monitoring
- Capacity building
- External Environmental Audit

8.2 List of Negative Attributes and Sub-projects

Research sub-projects – both lab-based and field-based research activities – involving the following attributes will not be supported under the NATP-2:

- Research activities that involve pesticides that fall in WHO classes IA, IB and II and pesticides banned by the Government of Bangladesh.

- Activities involving significant conversion or degradation of critical natural habitats including wetlands.
- Activities within Protected Areas (Wildlife Sanctuaries and National Parks).
- Activities that involve Genetically Modified Organisms (GMOs) that have not been approved by an independent panel of internationally recognized experts, and cleared by the World Bank.

8.3 Categorization of sub-projects

NATP-2 will fund various research sub-projects under the Enhancing the Agricultural Innovation System component. To strengthen the institutional capacity of the NARS, NATP-2 will invest in:

(i) building the institutional and human capacity of the NARIs, including technical assistance to BARC, BFRI and BLRI, as well as support for human capital development through a limited number of funded doctoral studies;
(ii) developing research infrastructure at NARI facilities (e.g., renovations, laboratories, equipment); and
(iii) developing a comprehensive agricultural research and development web-based platform that will also serve as a research database and knowledge center for the country's agricultural innovation system.

To support the development of innovative agricultural technologies, mobilize available research capacity, stimulate scientific creativity and promote efficiencies in the research system, AIF-1will support:

(i) a Competitive Research Grant Program (CRGP) for NARIs and other recognized in-country public and private research providers, as well as
(ii) block grant funding for a limited number of comprehensive core research programs led by NARIs.

The possible sub-projects to be funded under the NATP-2 have been categorized on the basis of the level of environmental assessment they need to go through. This categorization is provided in Table 8-1.

Table 8-1: Categorization of sub-projects under the Component 1 (Agricultural Technology Generation)

Specific Interventions	*Sub project*	*Major Negative Impacts*	*NATP Categorization based on EA requirement*
Capacity Building	Trainings, Doctoral studies	Nil	Excluded from EA requirement
ICT for research - Development web-based platform.	Creating web platform	Nil	Excluded from EA requirement
Research Infrastructure Development – renovation, equipment and laboratories	Infrastructure support	Construction related health and safety issues	LEA (Sub-projects involving only renovation work on existing infrastructure are excluded from EA requirement) **Renovation of infrastructure or laboratory are excluded from EA requirement
Agricultural research	Research	Inputs and technologies to be	Screening & LEA

Specific Interventions	*Sub project*	*Major Negative Impacts*	*NATP Categorization based on EA requirement*
(Competitive Research Grant program or Block Grant)		used in the proposed research may have negative impacts	

8.4 Environmental Assessment of Research Sub-projects

Environmental Assessment is undertaken to identify the possible impacts and required mitigation measures for a research sub-project – including both lab-based and/or field-based research activities. In NATP-2, the supported research sub-projects will follow a two step environmental assessment process.

- **Environmental Screening:** Research concept notes (CN) will go through an environment screening using a list of exclusion criteria. The format for environmental screening of research proposals is attached in Annex 5.
- **Limited Environmental Assessment (LEA):** This level of environmental assessment is for those sub-projects that have relatively limited, localized and reversible environmental impacts and are classified as Green or Orange-A by the Department of Environment. Table 8-1 outlines the category of activities/sub-projects that will require LEA. CNs that are eligible for funding will carry out Limited Environmental Assessment on the full proposal. The LEA is carried out by the proponent of the research proposal. The LEA format for research proposals has been provided in Annex 6.

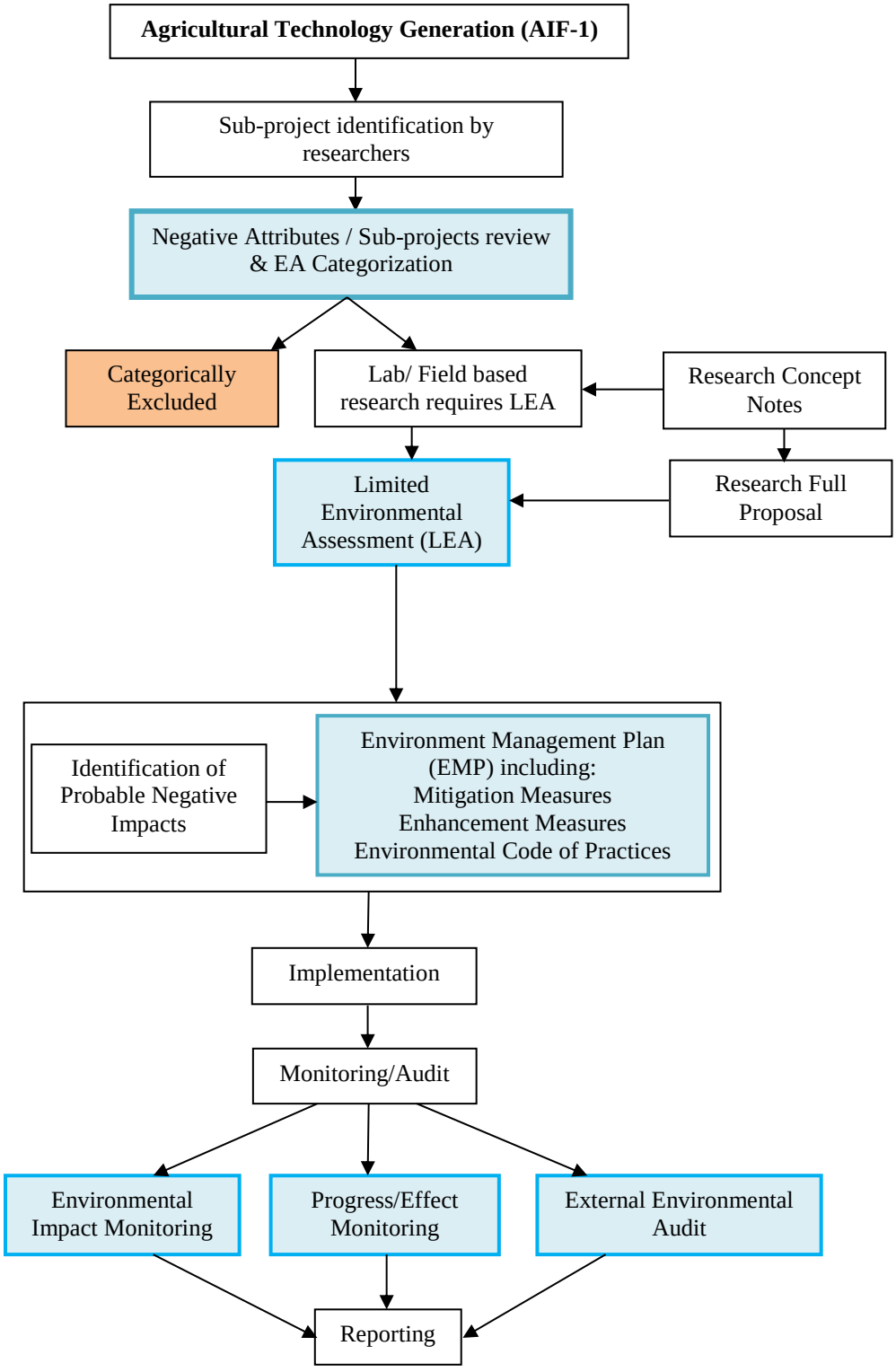


Figure 8-1: Environmental Management Process in the Agricultural Technology Generation Component of NATP-2

8.5 Environmental Management Plan (EMP)

The outcome of the environmental assessment will be a sub-project Environmental Management Plan (EMP).

Following the LEA, the research proponent will prepare an EMP that will become an integral part of the research sub-project proposal. The EMP will identify the technical and financial support required to implement the necessary mitigation measures and will include this in the sub-project cost. The format for the EMP for research sub-projects is included in Annex 6.

The major components of an EMP include: mitigation measures, enhancement measures, ECoPs, estimation of cost of EMP, environmental monitoring, and institutional arrangement for implementation of EMP. The Table 8-2 shows environmental impacts and potential mitigation measures to be recommended in the NATP-2. The EMP consists of the following components:

- Environmental Mitigation Measures
- Environmental Enhancement Measures
- Environmental Code of Practices
- Environmental Monitoring and Audit
- Institutional Arrangements
- Capacity Building Plan
- Budget for implementation of EMP

8.5.1 Environmental Mitigation Measures

Most of the negative impacts that may occur through the implementation of NATP-2 sub-projects can be easily mitigated. Table 8-2 shows the list of mitigation measures suggested for sub-projects to be implemented under the Agricultural Innovation System component of NATP-2. This list of potential impacts and mitigation measures will guide the LEA.

Table 8-2: Environmental impacts and mitigation measures for sub-projects under Component 1 (Agricultural Technology Generation)

Nature of sub-projects to be supported	*Potential negative environmental impacts*	*Mitigation measures*
Development of new infrastructure development for research facilities	• Cutting of trees for construction of research facilities leads to loss of greenery. • Open disposal of debris after construction may obstruct drains, fill up wetlands, etc. • Dust and noise pollution during construction are harmful to local environment and nearby residents. • High energy use for construction activities.	• Ensure Location Clearance and Environment Clearance from Department of Environment. • Avoid cutting trees to extent possible and replant where necessary. • Dispose construction waste in landfills or reuse to the possible extent. • Take necessary precautions like spraying water to control dust pollution. • Use energy efficient machinery and material to the extent possible.

Nature of sub-projects to be supported	*Potential negative environmental impacts*	*Mitigation measures*
Agricultural research – field based	<u>Pest Management</u> • Use of hazardous pesticides impacting human and environmental health • Unsafe use of pesticides impacting human health • Overuse of pesticides impacting human and environmental health <u>Soil Degradation</u> • Imbalanced use of chemical fertilizers impacting environmental health <u>Ground Water Depletion</u> • Over-extraction of water for irrigation leading to ground water depletion <u>Surface Water Quality Deterioration</u> • Deterioration of water quality through surface runoff contaminated with pesticides or chemical fertilizer <u>System Loss of Water</u> • Inefficient use of water for irrigation leading to wastage <u>Arsenic Contamination</u> • Use of Arsenic contaminated water leading to impact on human health <u>Soil Salinity</u> • Use of saline water in irrigation <u>Biodiversity</u> • Loss of native crop varieties • Introduction of invasive species/varieties <u>Climate Risk</u> • Crop production vulnerable to extreme rainfall, dry spells, flood, drought or other climatic events	• Integrated Pest Management as per Pest Management Plan • Organic Farming • Soil test based fertilizer application • Ensure safe distance between 2 tube wells • Use of efficient irrigation methods (sprinkler, drip, buried pipes, etc.) • Water quality testing to check suitability of water for irrigation • Conservation of native crop varieties • Use IPM and organic or balanced fertilizer
Agricultural research – lab based	<u>Occupational Health</u> • Risk of contamination, infection, injury, poisoning, etc., due to poor occupational safety practices in laboratories • Risk of contamination, infection, injury, poisoning, etc., due to poor biomedical and chemical waste management practices in laboratories <u>Biodiversity</u> • Loss of native crop varieties • Introduction of invasive species/varieties	• Use of protective gear by workers for safety and sanitation • Safe disposal of laboratory wastes as per prescribed rules for biomedical waste management and effluent release • Conservation of native crop varieties

8.5.2 Environmental Enhancement Measures

While environmental mitigation measures will be identified and implemented to reduce negative impacts, the project will also implement enhancement measures to amplify or strengthen positive impacts.

Some of the research themes on environmental enhancement suggested for the NATP-2 are provided below:

- Organic farming practices
- Farm and processing machinery that is energy efficient and/or runs on renewable energy
- Various techniques on IPM
- Efficient irrigation management
- Measures for climate adaptation in the small holder crop, livestock and fisheries sectors
- Conservation of traditional/native crop and livestock varieties/breeds
- Best or economic use of livestock waste
- Soil nutrient management

Some of the environmental enhancement measures suggested for integration into the infrastructure development support for research institutions under NATP-2 are:

- Promotion of sustainable building technologies (e.g., stabilized mud blocks)
- Incorporation of green building elements (e.g., energy efficient building design, rainwater harvesting, etc.)
- Use of energy efficient devices and/or renewable energy (e.g., solar PV lighting systems)

8.5.3 Environmental Codes of Practice

The Codes of Practice provided for the crop development, livestock and fisheries sectors (sections 5.5.3, 6.5.3 and 7.5.3) will be applicable, as relevant, to all field-based research activities supported under the Agricultural Innovation System component of the NATP-2.

8.5.4 Environmental Monitoring Plan

The effectiveness of implementation of this EMF depends to a large extent on the implementation support provided at various levels. Monitoring to identify and suitably address any issues is thus important. Two types of monitoring will be implemented: i) sub-project environmental field monitoring and ii) environmental impact monitoring. Figure 8-2 shows the flow diagram of environmental monitoring system in NATP-2. Field monitoring of field research sub-projects will be carried out once in a cropping/production season and field monitoring of infrastructure development sub-projects will be carried out twice during the construction period. Monitoring of lab-based research sub-projects will be on annual basis. The monitoring plan of Agricultural Innovation System component is outlined in Table 8-3 and the monitoring format is presented in Annex 11.

Figure 8-2: Environmental Monitoring Plan for Component 1 of NATP-2

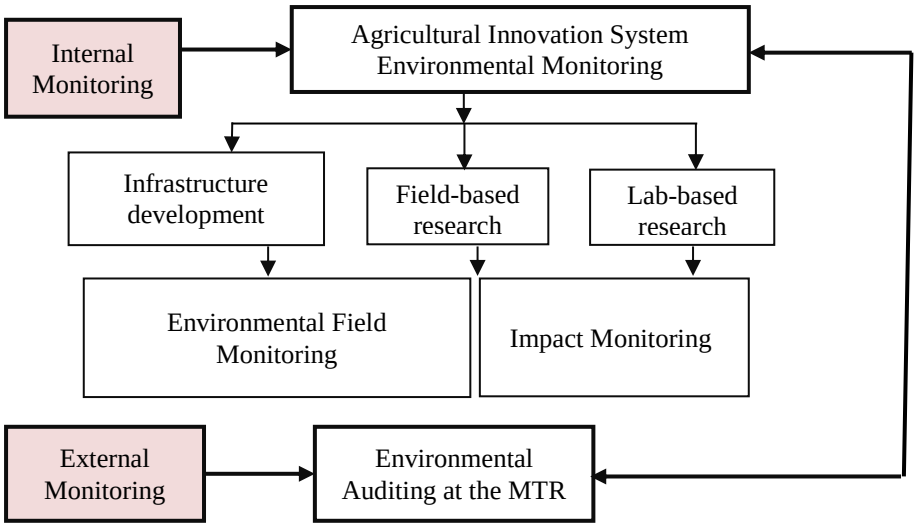


Table 8-3: Monitoring plan for Agricultural Innovation System component of NATP-2

Level	*Monitoring Responsibility*	*Monitoring Focus*	*Monitoring Methodology*	*Monitoring Frequency*
Research proponent	Focal Point for Environmental Safeguards in research institution	Monitoring implementation of mitigation measures, Environmental Codes of Practice, Enhancement Measures	Desk/report review; Visits to research sub-project sites	Quarterly
PIU Environmental Safeguard Focal Point	Focal Point for Environmental Safeguards in PMU	Monitoring implementation of mitigation measures, Environmental Codes of Practice, Enhancement Measures	Desk/report review; Visits to subproject proponent research institutions	Yearly

8.5.5 External Environmental Audit

The PMU will hire an independent consultant agency to undertake an external environmental audit of the Agricultural Innovation System component of the project. This audit will be undertaken prior to the mid-term review so that environmental assessment and monitoring system of this component can be improved. The Terms of Reference for this audit are provided in Annex 14.

8.5.6 Institutional Arrangements

The key roles and responsibilities on environmental management are described in the Table 8-4.

Table 8-4: Roles and Responsibilities on Environmental Management in the Agricultural Innovation System component of NATP-2

Level	*Role*	*Responsibility*
Research proponent	Focal Point for Environmental Safeguards in research institution	Undertake screening and LEA of research sub-project proposals. Ensure implementation of mitigation measures as identified in the EMP.
National (PIU)	Focal Point for Environmental	Review environmental documentation in research sub-project proposals to ensure that the prescribed environmental

Level	*Role*	*Responsibility*
	Safeguards in PMU	management practices (as described in this EMF) are implemented. Ensure that excluded activities are not financed. Provide advisory assistance to research proponents in undertaking environmental screening and assessment of research sub-projects. Verify sub-project environmental categorization. Provide assistance to subproject proponent institutions (supported for research and institutional capacity building) in determining environmental issues, identifying and implementing actions from the Environmental Code of Practices, filling out required documentation, etc. Undertake environmental monitoring of research sub-projects.

8.5.7 Capacity Building

The environmental soundness of the interventions supported under the NATP depend to a large extent on the capacity of the research proponents to identify and suitably address any environmental impacts, and, to actively promote better environmental management.

The plan for capacity building of the research proponents is outlined in Table 8-5.

Table 8-5: Capacity Building Plan for Agricultural Innovation System component of NATP-2

Level	*Trainee Profile*	*Training Focus*	*Key Training Methodology*	*Training Frequency*	*Training Duration*
Research proponent	All relevant staff involved in implementation of the proposed research sub-project	Research sub-project specific, skill-based training on implementation of mitigation measures to be organized for all relevant staff involved in the research project including: • Environmental Codes of Practice • Integrated Pest Management and Pesticide Safety • Integrated Nutrient Management • Organic Farming • Water conservation • Climate adaptation • Food Safety • Environmental health and safety	Lecture	Prior to initiation of research sub-project implementation	1 day

8.5.8 Budget

The budget for implementation of the EMF for the Agricultural Technology Generation component of the NATP-2 is outlined in Table 8-6.

Table 8-6: Budget for the Agricultural Innovation System component of NATP-2

Sl.	*Agriculture*	*Unit*	*Unit cost (BDT)*	*No. of units*	*Total*
1	Environmental Research on agricultural waste management and other good practices	# of research	5000000	-	5000000
2	Trainings suggested in Table 8.5	Training	1000000	3	300000
3	External Environmental Audit	Study	500000	1	500000
	Total				5800000

8.5.9 Construction and Civil Works

All construction activities must incorporate standards for public and worker safety prescribed by the Government of Bangladesh (e.g., use of protective gear by construction workers, fencing off construction sites to prevent unauthorized public access, rehabilitation of borrow pits, compensatory plantation for any felled trees, etc.). Annex 15 describes the special environmental clauses for tender documents.

8.6 Review and Approval

After receiving the completed Environment Screening and LEA report of the selected research sub-project, the PMU Environment Safeguards Specialist will assess the adequacy of the mitigation measures and EMP. This assessment will be conducted through desk review and will concentrate on the quality of the baseline information, identification of potential impacts, effectiveness and the adequacy of the mitigation measures, and monitoring plan. This report will be submitted to the PD for approval and further action.

8.7 Compliance Check by IDA

MoA will seek concurrence of the World Bank Team in view of their compliance with environment guidelines. IDA can ask for further clarification for strengthening the environmental documentation. In that case, MoA will take necessary action to improve or revise the document and resubmit to the IDA for re-examination.

9 Public Consultation and Disclosure

9.1 Public Consultation

Public consultation and acceptance is one of most important and difficult part of any development project. The following section will outline the steps that need to be followed to disclose all the project related information as well as collect and incorporate public views into the overall project planning, implementation and monitoring. A summary of local problems identified through public consultation is attached in Annex 16.

9.1.1 Guidelines on Conducting Consultations

Sub-project related information needs to be collected and disclosed to the community so that all the project affected persons (if any) are informed and take part in the development process. All the activities within the sub-projects will be finalized after extensive discussion with local community and approval of the relevant stakeholders. The following key stakeholders will be considered for this project:

- CIGs farmers
- Non-CIG farmers
- Local community
- Local NGOs
- Local government and political leaders

A range of participatory tools and methods will be used to accommodate people's perceptions on different stages of the project. The methods are outlined below:

Environmental assessment

Environmental assessment will be conducted to find out the current environmental state of the selected projects. This will be carried out in the planning phase of the project.

Focus Group Discussion

Both at the planning and implementation stages focus group discussions will be conducted with the local community and CIG, Non-CIG farmers. Representatives from the local UP will share their opinion and experiences regarding the project interventions. Their suggestions and thoughts will also be incorporated to make the project more "community centered".

Key informant interview

Key Informant Interview (KII) with the Local Government and NGO officials, community leaders, local participants and land farmers during pre-selection, selection, and implementation stage is also a major part of public consultation. The NATP-2 staff and officials will play a major role in the successful implementation of the project. Interviews with local participants, local politicians and land farmers is very much important. Through the KIIs with all these officials and public representatives, various problems can be identified and resolved.

Public hearing and approval

This is mainly a design stage public consultation. The objective of the project, all the plans and designs, probable impact of the interventions and so on will be openly discussed with the

selected farmers and community people. If they think that the sub-projects will not put any adverse impact on their lives and agree with the project idea, the project will be finalized. The Table 8-1 discusses the information dissemination and consultation framework for the proposed project.

9.2 Disclosure

The environmental issues in a subproject should be disclosed along with the subproject information as possible and feasible in order to make information available to the public. This is also in the spirit of the World Bank's Policy on Disclosure of Information. Communities should be made aware of any project works or activities that may affect them. Public consultation with pertinent stakeholders (including Project Affected Peoples and beneficiaries) in a language and form that is appropriate to the needs of the community will be undertaken and documented during environmental screening and before a subproject team decides on an environmental category.

In NATP-2, MoA and MoFL will follow the disclosure requirement of the World Bank on environmental documentation. After the clearance from the World Bank, the draft final version of the EMF will be posted in the website of MoA and MoFL along with a Bangla summary version and will be kept in the offices for further comments and inputs from non-governmental organization, civil society and general public. Newspaper advertisement will be published in two national dailies (English and Bangla) about the disclosure and request for comments on EMF. It will be disclosed in English by World Bank and it will also be made available at the World Bank‘s InfoShop. The EMF will be finalized taking into consideration of the comments received on draft version and will be available in the MoA and MoFL websites.

Table 9-1: Information dissemination and consultation framework

Project Stage	*Information to be disclosed*	*Consultation Steps*
Sub-project planning and design	In this part the environmental assessment team will conduct a detail assessment of the proposed intervention. The analysis of the assessment will be disclosed for all the PAPs which will contain the following information: – More detail current situation of the environment of the proposed areas. – All the potential environmental impact due to the design interventions. – A portfolio of the effected people and community groups – Residual environmental impacts and enhancement measures	The LEA or DEA (if required) will be conducted through detail investigation of baseline, potential environmental impact and possible mitigation options in the selected community for selected development interventions. It needs to be assured that community holds a stake in perceiving and finalizing all the design intervention. Then community will identify the probable environmental impact they might face. The project team will also discuss their findings with local community and all the information will be disclosed publicly through the DEA report.
	After the analysis of the Environmental Assessment, SAAO/LEAF/SEAL will disclose a project report that which will incorporate the following information: – The final design – The implementation mechanism – Detail outline of all the mitigation measures to be taken to reduce the	In this stage, the final LEA, DEA and EMP report (if required) will leave at public disclosure so that all the PAPs and related stakeholder can comment on the final design. A public hearing needs to be organized and the project has to be approved and fully agreed by the relevant authority, organization and local

Project Stage	*Information to be disclosed*	*Consultation Steps*
	unavoidable environmental impacts. – Time duration and cost of project implementation. – Mechanisms for financing the project. – Grievance Redress Mechanisms (GRM) At the same time, an Environmental Management Plan for mitigating the residual impact. As well as monitoring mechanism need to be addressed at this stage.	community.
Implementation	In this stage, the implementing team will give regular update of the implementing progress. The reports should include the following information: – Level of complacence with the recommendations proposed during the LEA/DEA. – Compensation update to the affected people. – Any unexpected reactions by any PAPs or stakeholders.	Any compensation claims or disputes should be minimized though proper consultation with stakeholders.
Monitoring and Evaluation	During implementation or after the project is completed, it has to be insured that all the proposed outcome is achieved, proper mitigation measures is taken to reduce the environmental impacts and the urban poor is benefited with a better living settlement. The project implementing team should report all the mitigation measures taken, the entire grievance settled and all the recommendation made in the EMF is incorporated.	A two way monitoring mechanism will be in place. The project progress will be monitored by the respective government authorities. On the other hand a local level monitoring committee will be formed by the community leaders and inhabitants. The project implementation team will regularly consult with them to ensure effective progress.

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Annexures

Annex 1: Agro-ecological Zones of Bangladesh

Agro-ecological Zones of Bangladesh[36]

Thirty agro ecological zones (AEZ) have been identified by the Soil Resources Development Institute (SRDI), as relevant for land use and for assessing agriculture potential. The 30 zones can be broadly categorized into seven different agroecological regions covering almost the entire country - the Barind Tract, Tidal Flood plains, Modhupur Tract, Himalayan Piedmont Plain, Beel and Haor Basins, Northern and Eastern Hills, and Floodplains.

1. Barind Tract: Mean annual rainfall is around 1800mm. The major cropping pattern is Boro (Rice in irrigated ecosystem November to July)-Fallow-T. Aman (Rice: July-December). Groundwater resources are available generally, but not in the hills. Most of the surface water available is used for irrigation.
2. Tidal Flood Plains: Most of the country is part of a generally flat flood plain (Tidal Floodplain and Floodplain). Rainfall varies from 1500 mm to 4000 mm throughout the floodplains. The soil, based on silt deposits, is fertile.
3. Modhupur Tract: The Madhupur Tract covers an area of 4244 km2 on the northeastern and eastern edges of the Barind Tracts. The mean annual rainfall is 2,000 mm. Red soil coats the Madhupur Tracts; Aus (Rice: April – August), potatoes, mustard, wheat, and sugarcane as well as fruit orchards are commonly grown. Surface and ground water supply is widely available.
4. Himalayan Piedmont Plain: The Himalayan Piedmont Plain is comprised of complex relief patterns, with narrow floodplain ridges and linear depressions. The soil is predominantly sandy loam to silty clay texture; average annual rainfall ranges from 1600 to 2000 mm. Boro-Fallow-T. Aman is the major cropping pattern. Surface water is available for dry season irrigation.
5. Beel and Haor Basins: The Haor and Beel basins provide one crop per year. The highest rain fall takes place in this area – 2500 mm- 5000 mm in Sylhet area.
6. Northern and Eastern hills: Northern and Eastern Hills, covering 18,171 km2, has mean annual rainfall ranging from 2000 to 25,000mm. The soils are loamy but extremely acidic. In the hills there is a lack of surface water. Jhum (shifting) or terrace cultivation is common; boro cultivation in this area is quite low.
7. Flood plains: Most of the country is part of a generally flat flood plain (Tidal Floodplain and Floodplain). Rainfall varies from 1500 mm to 4000 mm throughout the floodplains. The soil, based on silt deposits, is fertile.

[36] Agriculture and Adaptation in Bangladesh: Current and projected impacts of climate change, viewed at ftp://ftp.cgiar.org/ifpri/LDanessi/USAID-Reports/Final%20Report-Bangladesh%20Agriculture%20and%20Climate%20Change.pdf

Annex 2: List of Proven Agricultural Technologies ready for Scaling in NATP-2

	Crops	*Livestock*	*Fisheries*
Productivity enhancing technologies	Yield gap reducing technologies for main cereals and oil crops	Improved management for poultry rearing (broiler, layer pullet, local breed)	GIF Tilapia mono culture
	Alternate Wetting and Drying (AWD) irrigation for Boro rice	Improved management for duck rearing	Pangus polyculture (semi- intensive)
	Summer tomato production	Modern management for dairy, sheep and buffalo farming	Tilapia carp polyculture
	Enhanced orchard establishment and fruit tree management	Enhanced beef fattening using urea-molasses-straw mixes	Koi polyculture
	Compost production and improved soil management	Goat rearing using slat system for housing	Carp polyculture with improved pond fertilization strategy
	Integrated Pest Management (IPM) in vegetables	Production management for high yielding varieties of green fodder	Freshwater prawn polyculture
	Establishment of homestead vegetable gardens	Silage and hay production	Cage culture (a) GIF tilapia (b) pangus
	Promotion of newly released varieties (BAU Garlic-3, BARI Lentil-7, BINA Dhan-10, …)	Vaccination and deworming campaigns	Pen culture (a) Polyculture of carp and GIF tilapia (b) Polyculture of pangus
		Artificial insemination	Application of formulated pellet fish feed prepared using locally available ingredients suitable to different production models
			Pure line development of GIF fish verities (Tilapia, Pangus and Koi)
			Cryopreservation techniques in fish hatcheries
Post-harvest loss reducing technologies	Enhanced post-harvest handling (packaging of rice, mustard, wheat and onions)	Liming and cold storage for egg preservation	Low-cost insulation/cold storage facilities
	Cleaning, sorting, grading and packaging of vegetables	Chilling plants for milk conservation	Promotion of styrofoam boxes for transportation
		Improved slaughterhouses and dressing houses for safer meat production	Enhanced fish landing centers
			Improved transport equipment for live fish
Agro-food processing	Private sector-led processing of smallholder produced mungbeans, oil crops, and tomatoes	Preparation of indigenous dairy products	Depuration to remove off flavor of pangas, tilapias
		Milk pasteurization	Dressed fish (koi, tilapia, major carps)
			Production of value added products such as fish fillet, fish balls, fish nuggets
Others (e.g. adaptation to climate change)	Promotion of heat tolerant wheat varieties	Promotion of salinity tolerant fodder varieties in coastal areas	Mullet and GIF Tilapia for salinity prone areas
	Promotion of saline tolerant as well as short growth cycle varieties of rice	Introduction of duck, sheep and buffalo rearing in low lying areas	Short-cycle aquaculture for draught/flood prone areas

	Crops	*Livestock*	*Fisheries*
	Promotion of mushroom production	Bio-gas production	Beel and Baor fishery management and stock enhancement
	Off-season vegetable production	Manure management in dung pits	Beel nursery
	Climate-smart agriculture, soil conservation through zero/reduced tillage	Dead bird disposal system for poultry	
	Promotion of dry seed bed	Ration balancing for methane reduction	
	Promotion of dhap (floating vegetable vulture) in low lying areas	Targeted breeding plans for environmental adaptation	

Annex 3: Categorization of NATP-2 Sub-projects

3.1 Categorization of Agriculture Sub-projects

Component	*Specific Interventions*	*Sub project*	*NATP Categorization based on EA requirement*
Supporting Crop Development	Enhancing skills of public extension workers	Trainings Information material	None
	Renovation of infrastructures	Seed testing lab, horticulture center	None
	Promotion of good agricultural practices developed under NATP-1	Extension on package of practices and inputs	LEA
	Integrated Pest Management and climate-smart technologies	Trainings, demonstrations	LEA
	Promoting mechanization	Tractors, tillers, harvesters, etc.	LEA
		Processing equipment	LEA
	Infrastructure improvement for value chains, Agro-processing for the value chains selected	Construction of processing units Processing machinery Cold storage	DEA
	Aggregation of commodities	Market yards	LEA
	Capacity building to address women's needs	Trainings	
	Homestead gardening with Women groups	Kitchen garden	LEA
	Establishment of seed testing laboratory	Seed testing equipment	LEA

3.2 Categorization of Livestock Sub-projects

Nature of sub-projects to be supported	*NATP Categorization based on EA requirement*
Modern management for dairy, sheep and buffalo farming	LEA (10 cattle heads or below in urban areas and 25 cattle heads or below in rural areas) DEA (above 10 cattle heads in urban areas and above 25 cattle heads in rural areas)
Introduction of sheep and buffalo rearing in low lying areas	LEA (10 cattle heads or below in urban areas and 25 cattle heads or below in rural areas) DEA (above 10 cattle heads in urban areas and above 25 cattle heads in rural areas)
Enhanced beef fattening using urea-molasses-straw mixes	LEA
Goat rearing using slat system for housing	LEA
Production management for high yielding varieties of green fodder; Promotion of salinity tolerant fodder varieties in coastal areas	LEA
Silage and hay production	LEA
Chaff cutters	LEA
Mini-feed compounding and mixing units	DEA
Bio-gas production	LEA
Manure management in dung pits	LEA
Milking machines	LEA
Milk collection	LEA
Chilling plants for milk conservation	DEA

Milk pasteurization	DEA
Preparation of indigenous dairy products	DEA
Improved small-scale slaughterhouses and dressing houses for safer meat production	DEA
Input marketing	LEA
Commodity marketing	LEA
Marketing facilities for sale of goats	LEA

3.3 Categorization of Fisheries Sub-projects

Specific Interventions	*Sub project*	*NATP Categorization based on EA requirement*
Promote productivity through an integrated approach	Specific fish production models	LEA
	Quality fish seed	LEA
	Quality fish feed	LEA
	Application of fisheries management tools	None
Semi intensive fish production models to promote productivity and profitability	Genetically Improved Farm (GIF) Tilapia monoculture	LEA
	GIF Tilapia polyculture	LEA
	Pangas polyculture	LEA
	Freshwater prawn polyculture	LEA
	Koi polyculture	LEA
	Carp polyculture	LEA
Assured supply of quality fish seed	Fish seed of GIF tilapia	LEA
	Stock improvement of climbing perch and Thai pangas	LEA
Formulated fish feed with local ingredients	Fish feed preparation units	DEA
Promotion of climate resilient innovative technologies	Use of short seasonal water bodies	LEA
	Tolerant species in saline areas	LEA
	Innovations like cage fish culture, pen farming in open water	LEA
Increasing local extension agents	Recruitment, training programmes	None
Promoting farmer to farmer extension	Training programmes	None
Strengthening research extension linkage	Outreach programmes	None
Investment in development and enhancement of value chains	Improvement and management of fish marketing infrastructure	DEA
	Preservation of fish	DEA
	Setting up cold storage structures	DEA
	Setting up small ice plants	DEA
	Food safety and feed quality	DEA
Institutional capacity enhancement for quality control	Training programmes	None

3.4 Categorization of Research Sub-projects

Component	*Specific Interventions*	*Sub project*	*NATP Categorization based on EA requirement*
Enhancing Agriculture Innovation	ICT for research - Development web-based platform that will also serve as a research database and knowledge center.	Creating web platform	None
	Infrastructure Development – Renovation of equipment and laboratories	Infrastructure renovation support	DEA
	Capacity Building – technical Assistance for	Trainings	None

	institutional staff		

Annex 4: Formats for Limited Environmental Assessment (LEA)

4.1 Limited Environmental Assessment (LEA) on Demonstration

4.1.1 LEA on Demonstration - Agriculture (Crop Production)

Part A: General Description
Screening date: _____
Name of Upazila: _____
Name of district: _____
Name of sub-project being proposed: _____

Brief description of activities to be undertaken under the sub-project:
_____
_____
_____
_____

Part B: Assessment of Negative Impacts of the Proposed Activities in the Sub-project. Tick (✓) all likely impacts
Pest Management
☐ Use of hazardous pesticides impacting human and environmental health
☐ Unsafe use of pesticides impacting human health
☐ Overuse of pesticides impacting human and environmental health
Soil Degradation
☐ Imbalanced use of chemical fertilizers impacting environmental health
Ground Water Depletion
☐ Over-extraction of water for irrigation leading to ground water depletion
System Loss of Water
☐ Inefficient use of water for irrigation leading to wastage
Arsenic Contamination
☐ Use of Arsenic contaminated water leading to impact on human health
Soil Salinity
☐ Use of saline water in irrigation
Biodiversity
☐ Loss of native crop varieties
Climate Risk
☐ Crop production vulnerable to extreme rainfall, dry spells, flood, drought or other climatic events
☐ Any other, mention:

Part C: Environmental Management Plan for the Sub-project

Identified Mitigation/Enhancement Measures. Tick (✓) all required measures	*Implementation Schedule*	*Budget*	*Monitoring frequency*
Pest Management			
☐ Integrated Pest Management as per Pest Management Plan			

Identified Mitigation/Enhancement Measures. Tick (✓) all required measures	*Implementation Schedule*	*Budget*	*Monitoring frequency*
☐ Use of tolerant varieties			
☐ Crop Diversification			
☐ Planting of multiple varieties with varying susceptibility to pests			
Soil Degradation			
☐ Organic Farming			
☐ Soil test based fertilizer application			
☐ Preparation and Application of Compost			
☐ Use of organic matters like animal manures including cow-dung and farmyard manures, green manure, oilcake, industrial organic wastes, homestead waste etc.			
☐ Application of vermi-compost			
☐ Growing leguminous crops for biological nitrogen fixation (BNF)			
☐ Incorporation of biomass of leguminous crops into the soil after harvesting pods and nuts			
Underground Water Depletion			
☐ Ensure safe distance between 2 tube wells as prescribed for various regions of the country			
☐ Use of rain water			
☐ Growing pulses, oil seeds, wheat etc. requiring much less water than growing rice			
System Loss of Irrigation Water			
☐ Use of efficient irrigation methods (sprinkler, drip, buried pipe line etc.)			
☐ Upgrading the skill of the farmer in on-farm water management			
☐ Use of Alternate Wetting & Drying method of irrigation			
Arsenic Contamination of Water			
☐ Water quality testing to check suitability of water for irrigation			
☐ Promote rain-fed agriculture			
Biodiversity			
☐ Conservation of native crop varieties in Gene Banks of ARIs			
☐ Facilitation of germplasm preservation by local agencies			
☐ Improvement of indigenous crop varieties for higher yield.			
☐ Use of environment-friendly characters of indigenous varieties in crop breeding programs.			

Identified Mitigation/Enhancement Measures. Tick (✓) all required measures	*Implementation Schedule*	*Budget*	*Monitoring frequency*
Climate Risk			
☐ Development of drought/flood tolerant varieties			
☐ Use of integrated water resources management (IRWRM)			
☐ Any other, mention:			

Prepared by (Name, Designation, Signature, Date): _____
Reviewed and Approved by (Name, Designation, Signature, Date): _____

4.1.2 LEA on Demonstration - Livestock (Dairy and Goat Rearing)

Part A: General Description
Screening date: _____
Name of Upazila: _____
Name of district: _____
Name of sub-project being proposed: _____

Brief description of activities to be undertaken under the sub-project:
_____
_____
_____
_____

Part B: Assessment of Negative Impacts of the Proposed Activities in the Sub-project. Tick (✓) all likely impacts.
☐ Air pollution from dairy and poultry farms.
☐ Land/vegetation degradation due to overgrazing
☐ Pollution from poor manure management
☐ Health risk (zoonotic diseases) from poor housekeeping and handling of livestock's
☐ Gradual extinction of native livestock breeds due to promotion of only exotic breeds
☐ Death of hybrid calves (16% hybrid calves die within the first three months from birth).
☐ Any other, mention:

Part C: Environmental Management Plan for the Sub-project

Identified Mitigation /Enhancement Measures. Tick (✓) all required measures	*Implementation Schedule*	*Budget*	*Monitoring frequency*
☐ Distance of the dairy/poultry farms from human habitation should be maintained as per DOE rules.			
☐ Location Clearance and Environment Clearance as applicable from Department of Environment			
☐ Grazing management (rotational grazing)			
☐ Fodder management incorporating fodder cultivation, stall feeding, supplementary feeds, use of chaff cutter, etc.			
☐ Improved composting methods – pit composting			
☐ Maintenance of safe distance between manure pit and water sources			
☐ Periodic and regular removal of slurry from biogas plants for reuse as manure			
☐ Construction of shed location and design as per technical recommendations			
☐ Maintenance of shed sanitation and hygienic			

handling			
☐ Promotion of improved indigenous breeds			
☐ Training to dairy farmers getting hybrid calves on improved methods of calf rearing.			
☐ Any other, mention:			

Prepared by (Name, Designation, Signature, Date): _____
Reviewed and Approved by (Name, Designation, Signature, Date): _____

4.1.3 LEA on Demonstration - Livestock (Slaughterhouse)

Part A: General Description
Screening date: _____
Name of Upazila: _____
Name of district: _____
Name of sub-project being proposed: _____

Brief description of activities to be undertaken under the sub-project:
_____
_____
_____
_____

Part B: Assessment of Negative Impacts of the Proposed Activities in the Sub-project. Tick (✓) all likely impacts
☐ Health risk (zoonotic diseases) from poor housekeeping and handling during & after slaughtering
☐ Contamination of meat due to unhygienic practices
☐ Pollution due to improper disposal of solid and liquid wastes
☐ Occupational health and safety hazards from improper use of machinery
☐ Any other, mention:

Part C: Environmental Management Plan for the Sub-project

Identified Mitigation /Enhancement Measures. Tick (✓) all required measures	*Implementation Schedule*	*Budget*	*Monitoring frequency*
☐ Design of the slaughter house adheres to basic standards including elevated clean floor, drainage system and water, roof railings for evisceration, training to butchers on ante-mortem examination for un-healthy animals, hygienic slaughter, meat handling and waste management			
☐ Locate unit at safe distance from residential area (ensure Location and Environmental Clearance from DOE)			
☐ Implementation of prescribed cleaning and disinfection protocol for the equipment and the plant			
☐ Ensure effluent treatment and discharge as per plan approved by Department of Environment			
☐ Use of protective gear by workers for safety and sanitation			
☐ Any other, mention:			

Prepared by (Name, Designation, Signature, Date): _____
Reviewed and Approved by (Name, Designation, Signature, Date): _____

4.1.4 LEA on Demonstration - Fisheries (Fish Production)

Part A: General Description
Screening date: _____
Name of Upazila: _____
Name of district: _____
Name of sub-project being proposed: _____

Brief description of activities to be undertaken under the sub-project:
_____
_____
_____
_____

Part B: Assessment of Negative Impacts of the Proposed Activities in the Sub-project. Tick (✓) all likely impacts
☐ Fish farms obstructing flow of canals, interfering with wetlands
☐ Contamination of surrounding water bodies
☐ Pollution due to use of chemical feeds, fertilizers and antibiotics
☐ Loss of native fish diversity and aquatic diversity due to introduction of new and improved species
☐ Disposal of wastes
☐ Any other, mention:

Part C: Environmental Management Plan for the Sub-project

Identified Mitigation /Enhancement Measures. Tick (✓) all required measures	*Implementation Schedule*	*Budget*	*Monitoring frequency*
☐ Location of fish farm (ponds and wetlands) to be approved by the relevant LEAF & CIG members for avoiding obstruction of flow of canals, and contaminating surrounding water bodies.			
☐ Approval of LEAF to be obtained regarding the quality of chemical feeds, fertilizers and antibiotics.			
☐ Selection of varieties that does not pose any threat to local species.			
☐ Use of permitted chemicals and antibiotics in recommended doses.			
☐ Use natural feeds like rice bran to the extent possible in recommended doses.			
☐ Use natural manures, fertilizers in recommended doses			
☐ Species selection in poly-culture should be as per recommendation of the DOF – and designed to avoid competition with other species and aquatic life.			

☐ Proper and approved means of waste disposal should be practiced.			
☐ Any other, mention:			

Prepared by (Name, Designation, Signature, Date): _____

Reviewed and Approved by (Name, Designation, Signature, Date): _____

4.1.5 LEA on Infrastructure Development (construction of buildings, CCMC /market, research facilities)

Part A: General Description
LEA date: _____
Name of Upazila: _____
Name of district: _____
Name of sub-project being proposed: _____

Brief description of activities to be undertaken under the sub-project:
_____
_____

Part B: Assessment of Negative Impacts of the Proposed Activities in the Sub-project. Tick (✓) all likely impacts
☐ Degradation of natural habitats such as wetlands due to location in proximity
☐ Felling of trees due to location in proximity
☐ Degradation of cultural heritage sites such as historical buildings and artefacts due to location in proximity
☐ Interference with natural drainage pattern due to filling up of low-lying areas, borrow pits, etc.
☐ Pollution due to improper disposal of solid and liquid wastes generated from the construction activity,
☐ Noise and dust pollution during construction
☐ Occupational health and safety hazards
☐ Any other, mention:

Part C: Environmental Management Plan for the Sub-project

Identified Mitigation /Enhancement Measures. Tick (✓) all required measures	*Implementation Schedule*	*Budget*	*Monitoring frequency*
☐ Location of the facility at safe distance from natural and cultural heritage sites			
☐ Location of the facility to avoid tree felling – and in case unavoidable, provision for compensatory plantation			
☐ Location of the facility to avoid interference with natural drainage pattern			
☐ Rehabilitation of borrow pits			
☐ Measures to control dust and noise pollution during construction.			
☐ Disposal of solid and liquid wastes generated from the construction activity as per prescribed procedures and standards			
☐ Sealing of all boreholes to avoid accidental falls			
☐ Use of protective gear by workers for safety			
☐ Measures to prevent unauthorized public access to construction site			

☐ Design of the facility adheres to basic standards including safety, ventilation, water facility, drainage system, sanitation facility, waste disposal facility, etc.			
☐ Use of energy efficient equipment and appliances in facility			
☐ All water sources created (e.g., tube wells) must adhere to prescribed standards of water quality			
☐ Any other, mention:			

Prepared by (Name, Designation, Signature, Date): _____
Reviewed and Approved by (Name, Designation, Signature, Date): _____

4.2 LEA for Agro-processing on Crops, Livestock, Fisheries

Part A: General Description
Screening date: _____
Name of Upazila: _____
Name of district: _____
Name of sub-project being proposed: _____

Brief description of activities to be undertaken under the sub-project:
_____
_____
_____
_____

Part B: Assessment of Negative Impacts of the Proposed Activities in the Sub-project. Tick (✓) all likely impacts.
☐ Use of non-permissible chemical (e.g. calcium carbide for ripening, non-food grade dyes for coloring, anabolic steroids and feed additives, etc.) impacting human/livestock health
☐ Overuse of pesticides or use of hazardous pesticides (e.g. to control pests during storage) impacting human/livestock and environmental health
☐ Use of Arsenic contaminated water leading to impact on human/livestock health
☐ Air and noise pollution from activities such as milling, de-husking, crushing etc.
☐ Water pollution due to release of untreated effluent
☐ Possible un-hygienic practices contaminating food/feed
☐ Occupational health and safety hazards from improper use of machinery
☐ Location of the units and construction having negative impact on environment
☐ Usage of harmful chemicals like formaldehyde and toxic dyes for storage
☐ Pollution due to disposal of wastes like fish gut, scales and waste water from ice units and waste ice
☐ Use of contaminated water or arsenic polluted water for processing or for preparing ice
☐ Un-hygienic environment, un-hygienic practices in handling (not using protective gear, etc.)
☐ High energy requirement for processing machinery, ice units etc.
☐ Any other, mention:

Part C: Environmental Management Plan for the Sub-project

Identified Mitigation/Enhancement Measures. Tick (✓) all required measures	*Implementation Schedule*	*Budget*	*Monitoring frequency*
☐ Use only permissible, food-grade chemicals and packaging materials			
☐ Use of permitted preservatives as per recommended doses.			
☐ Integrated Pest Management to manage food/feed pests as per Pest Management Plan			
☐ Locate unit at safe distance from residential area (ensure Location and Environmental Clearance from DOE)			

Identified Mitigation/Enhancement Measures. Tick (✓) all required measures	*Implementation Schedule*	*Budget*	*Monitoring frequency*
☐ Ensure effluent treatment and discharge as per plan approved by Department of Environment.			
☐ Use of protective gears by workers for safety and sanitation			
☐ Use of water that meets permissible standards of As for human consumption			
☐ Use safe quality water for processing (washing and making ice).			
☐ Practice safe disposal of wastes (fish gut contents, scales, used ice, waste water, etc.) safely as per prescribed standards			
☐ Energy efficiency in processing, and storage should be ensured			
☐ Any other, mention:			

Prepared by (Name, Designation, Signature, Date): _____
Reviewed and Approved by (Name, Designation, Signature, Date): _____

Annex 5: Environmental Screening of Research Concept Notes on Crops, Livestock, Fisheries

Part A: General Description

Screening date: _____
Project ID No. (Concept Note / Full Research Proposal): _____
Title of the Project: _____
Location: _____
Brief description about the sub-project:
_____
_____
_____

Part B: Assessment of Safeguard Issues in the Proposed Research Sub-project. Tick (✓) all likely issues

S.No.	*Safeguard Issues**	*Yes*	*No*
1	Use of banned/hazardous agrochemicals		
2	Unsafe pest management		
3	Degradation of natural habitats		
4	Negative impacts of forest		
5	Involuntary resettlement		
6	Affecting indigenous people		
7	Threat to cultural property		
8	Threat to safety of dams		
9	Physical Obstruction and closing water flows affecting aquaculture, waterways, fisheries		
10	Risk of causing flooding, ground water depletion and saline intrusion		
11	Risk of increased arsenic contamination		
12	Adverse impacts on vulnerable sections of the society		
13	Increased drudgery for women		
14	Involvement of disputed areas		
15	Involvement of international waterways		
16	Endangering biodiversity including indigenous varieties or species (crops, livestock, fishes)		
17	GMO use		
18	Enhanced participation of small and marginal farmers		
19	Enhanced participation of women		
20	Women empowerment (leadership development)		

* If the answer is 'Yes' for anyone of the items from S.No. 1-17, the research proposal will be rejected. If not, please carry out Limited Environmental Assessment using format in Annex 6.

Prepared by (Name, Designation, Signature, Date): _____
Reviewed and Approved by (Name, Designation, Signature, Date): _____

Annex 6: LEA for Agricultural Research Full Proposals on Crops, Livestock, Fisheries

Part A: General Description
LEA date: _____
Project ID No. (Concept Note / Full Research Proposal): _____
Title of the Project: _____
Location: _____
Brief description about the sub-project:
_____
_____
_____
_____

Part B: Assessment of Negative Impacts of the Proposed Activities in the Sub-project. Tick (✓) all likely impacts
Pest Management
☐ Use of hazardous pesticides impacting human and environmental health
☐ Unsafe use of pesticides impacting human health
☐ Overuse of pesticides impacting human and environmental health
Soil Degradation
☐ Imbalanced use of chemical fertilizers impacting environmental health
Ground Water Depletion
☐ Over-extraction of water for irrigation leading to ground water depletion
System Loss of Water
☐ Inefficient use of water for irrigation leading to wastage
Arsenic Contamination
☐ Use of Arsenic contaminated water leading to impact on human health
Soil Salinity
☐ Use of saline water in irrigation
Biodiversity
☐ Loss of native crop varieties
☐ Introduction of invasive species/varieties
Climate Risk
☐ Crop production vulnerable to extreme rainfall, dry spells, flood, drought or other climatic events
Occupational Health
☐ Risk of contamination, infection, injury, poisoning, etc., due to poor occupational safety practices in laboratories
☐ Risk of contamination, infection, injury, poisoning, etc., due to poor biomedical and chemical waste management practices in laboratories
☐ Any other, mention:

Part C: Environmental Management Plan for the Sub-project

Identified Mitigation/Enhancement Measures. Tick (✓) all required measures	*Implementation Schedule*	*Budget*	*Monitoring frequency*
Pest Management			

Identified Mitigation/Enhancement Measures. Tick (✓) all required measures	*Implementation Schedule*	*Budget*	*Monitoring frequency*
☐ Integrated Pest Management as per Pest Management Plan			
☐ Use of tolerant varieties			
☐ Emphasis on crop diversification			
Soil Degradation			
☐ Integrated Nutrient Management			
☐ Emphasis on use of organic manures – compost, vermicompost, etc.			
Underground Water Depletion & System Loss of Irrigation Water			
☐ Emphasis on Integrated Water Resources Management			
☐ Emphasis on rain-fed farming			
☐ Emphasis on crops/varieties requiring much less water than rice			
☐ Promotion of efficient irrigation methods			
Arsenic Contamination of Water			
☐ Water quality testing to check suitability of water for irrigation			
☐ Promote rain-fed agriculture			
Biodiversity			
☐ Conservation and promotion of native crop varieties			
Climate Risk			
☐ Development of drought/flood tolerant varieties			
Occupational Health			
☐ Implementation of prescribed occupational health and safety protocol in research laboratories			
☐ Implementation of prescribed waste management protocol in research laboratories			
☐ Any other, mention:			

Prepared by (Name, Designation, Signature, Date): _____
Reviewed and Approved by (Name, Designation, Signature, Date): _____

Annex 7: Environmental Field Monitoring for Crops

Part A: General Description

Monitoring date: _____

i) Name of CIG…….. ii) Year of formation:…….
iii) Village:……iv) Union:……
v) Upazila: …… vi) District:……..

Part B: Monitoring Indicators

Alternate Wetting and Drying (AWD)

Activities/Indicators	**At present**	**Before**	**Remarks**
Name of farmer:	**Name of CIG:**		
Area coverage by AWD (ha)			
Liter of water use			
Reduction of water use by farmers (liter/ha)			

Integrated Pest Management (IPM) Technology

Activities/Indicators	At present	Before	Remarks
Name of farmer:	**Name of CIG:**		
Types of IPM technology adopted (Pheromone Traps, Brachonet, etc.)			
Area coverage by IPM (ha)			
Reduction of pesticides (Ripcord, Melathion, Sumithion) use (kg) due to practicing of IPM technology (kg/ha)			

Light Traps

Activities/Indicators	At present	Before	Remarks
Name of farmer:	**Name of CIG:**		
Use of light traps for rice pest- brown plant hopper, stem borer, green leaf hopper and fruit fly (for fruit & vegetables)	Use/Not use	Use/Not use	Tick one
Reduction in use (kg/ha or %) of Basudin, Carbofuran, etc.			

Composting

Activities/Indicators	At present	Before	Remarks
Name of farmer:	**Name of CIG:**		
No. of compost pits produced			
Amount of compost produced (kg)			
Kg of urea used			
Amount of compost applied in the field (kg)			
Reduction in urea use (kg) due to use of compost (kg/ha)			

Organic Fertilizer

Activities/Indicators	At present	Before	Remarks
Name of farmer:	**Name of CIG:**		
Amount of organic fertilizer produced (kg)			
Amount of organic fertilizer applied in the field (kg)			

Kg of urea used			
Reduction in urea use (kg) due to use of organic fertilizer (kg/ha)			

Balanced Fertilizer

Activities/Indicators	At present	Before	Remarks
Name of farmer:	**Name of CIG:**		
Kg of urea, Triple Super Phosphate, Zinc, Zipsum/ Sulphur and Muriate of Potash used			
Reduction in urea use (kg) due to balanced fertilizer use (ka/ha)			
Increase in use of TSP, Zinc, Zipsum/Sulphur and MP due to balanced fertilizer use (ka/ha)			

Homestead Gardening

Activities/Indicators	At present	Before	Remarks
Name of farmer:	**Name of CIG:**		
Kg of inorganic fertilizer use			
Reduction in urea use (kg) due to use of organic fertilizer (kg/ha)			
Kg of pesticide used			
Reduction in pesticide use (kg) due to homestead gardening (kg/ha)			

Agro-processing

Activities/Indicators		At present	Before	Remarks
Name of farmer:	**Name of CIG:**			
Maintenance of Sanitary & Phyto-sanitary Standards (SPS) & Maximum Residual Levels (MRL) in produce	Hazardous pesticide residues			
	Use of Formalin			
	Use of Carbamite			
Contamination during supply chain	Harmful chemicals for ripening/coloring			
Processing & Transportation	Use of unhygienic packaging materials, wash water, etc.			

Training

Name of farmer:	**Name of CIG:**		
Training on safe use of pesticides conducted	Yes/No	Yes/No	Tick one

Any other observations: _____

Monitoring by (Name, Designation, Signature, Date): _____
Reviewed by (Name, Designation, Signature, Date): _____

Annex 8: Environmental Field Monitoring for Livestock

Part A: General Description

Monitoring date: _____

i) Name of CIG…….. ii) Year of formation:…….
iii) Village:……iv) Union:……
v) Upazila: …… vi) District:……..

Part B: Monitoring Indicators

Composting

Activities/Indicators	At present	Before	Remarks
Name of farmer:	**Name of CIG:**		
No. of compost pits produced			
Amount of compost produced (kg)			
Amount of vermin-compost produced (kg)			
Amount of compost applied in the field (kg)			
Reduction in urea use (kg) due to use of compost (kg/ha)			

Biogas Plant

Activities/Indicators	At present	Before	Remarks
Name of farmer:	**Name of CIG:**		
No. of biogas plant installed using cow dung			
Cooking fuel saved (kg) due to use of biogas (kg/month)			
Slurry produced (kg) from biogas plant (kg/month)			
Slurry applied in the field (kg/ha)			

Slat System

Activities/Indicators	At present	Before	Remarks
Name of farmer:	**Name of CIG:**		
Use of Slat system for goats	Yes/No If yes, mention the benefits	Yes/No	Tick one

Liter and Carcass Management

Activities/Indicators	At present	Before	Remarks
Name of farmer:	**Name of CIG:**		
Proper liter and carcass management practices			
<u>Disposal of litter</u> • Using for Biogas • Disposal in pit for composting • Selling to other farmers/compost traders			

Deworming and Vaccination

Activities/Indicators	At present	Before	Remarks
Name of farmer:	**Name of CIG:**		
Nature of disease events reduced due to deworming and vaccination	No. of outbreak (%) cattle poultry goat	No. of outbreak (%) cattle poultry goat	

Training

Activities/Indicators	At present	Before	Remarks
Name of farmer:	**Name of CIG:**		
Training on bio-safety Received			
Training on Sanitary and Phyto-sanitary (SPS) Received			

Any other observations:

_____

Monitoring by (Name, Designation, Signature, Date): _____

Reviewed by (Name, Designation, Signature, Date): _____

Annex 9: Environmental Field Monitoring for Fisheries

Part A: General Description

Monitoring date: _____

i) Name of CIG: ……. ii) Year of formation:…….
iii) Village:……iv) Union:……
v) Upazila: …… vi) District:……..

Part B: Monitoring Indicators

Pond Water Testing for Improved Water Quality

Activities/Indicators	**At present**	**Before**	**Remarks**
Name of farmer:	**Name of CIG:**		
Conducted pond water testing for improved pond water quality	Yes/No	Yes/No	Tick one
P^H, Oxygen, Hardness (Na content), Chlorine, etc. content (with standard value) of pond water	Measured values P^H--- Na-- Chlorine--- Turbidity--	Standard values P^H --- Na-- Chlorine--- Turbidity--	Measures taken to obtain standard P^H, Na, Chlorine

Market Fish Testing against Formalin

Activities/Indicators	**At present**	**Before**	**Remarks**
Name of farmer:	**Name of CIG:**		
Fish tested against formalin	Yes/No	Yes/No	Tick one
Test found formalin along with severity (with allowable limit)			

Proper Pond Management

Activities/Indicators	**At present**	**Before**	**Remarks**
Name of farmer:	**Name of CIG:**		
Weedfish management and pond preparation done without using any hazardous chemical			
Pond sides turfing done to manage erosion and water pollution			
Pond embankment placed with fruit trees, forest trees, and perennial grass, etc.			

Agro-processing/Value Chain development

Environmental Issue	*Indicator*	*Unit of Measurement*	*At present*	*(Before NATP-2)*
Maintenance of Sanitary & Phytosanitary Standards (SPS) & Maximum Residual Levels (MRL) in produce.	Use of harmful preservatives for fish	Appropriate Unit		
	Formalin	"		
	Carbamite	"		
Contamination during supply chain	Harmful Chemicals for coloring	"		

Processing & Transportation	Use of unhygienic packaging materials, wash water, etc.	"		

Any other observations: _____

Monitoring by (Name, Designation, Signature, Date): _____
Reviewed by (Name, Designation, Signature, Date): _____

Annex 10: Environmental Field Monitoring for Agricultural Value Chains

Part A: General Description

Monitoring date: _____

i) Name of CIG/PO: …… **ii) Year of formation:…….**

iii) Farmer:.....

iv)Village:……v) Union:……

vi) Upazila: …… **vii) District:……..**

Brief description about the sub-project:

_____

_____

_____

Part B: Value Chains

Activities	At present	Before	Remarks
Functionality of CCMC and Other Information			
No. of CCMC functional			
No. of safe commodity marketed			
Quantity of safe commodity marketed (tons)			
Farmer's income increased (%)			
% gap between farm gate and consumer prices reduced			
No. of CCMC dispose waste regularly			
No. of farmers wash their produces (vegetables, fruits, etc.) with fresh water			
No. of farmers use toxic preservative in their produces before marketing			
No. of traders use toxic preservative in the commodities before marketing			
Zero Energy Preservation Process			
No. of farmers practicing zero energy preservation process			
Integrated Pest Management (IPM) Technology			
No. of farmers adopted IPM technology (Pheromone Traps, Brachonet, etc.)			
Area coverage by IPM (ha)			
Reduction of pesticides (Ripcord, Melathion, Sumithion) use (kg) due to practicing of IPM technology			
Light Traps			
No. of farmers using light traps for rice pest- brown plant hopper, stem borer, green leaf hopper and fruit fly (for fruit			

& vegetables)			
Reduction in use (kg/ton) of Basudin, Carbofuran, etc.			

Environmental Issue	Indicator	Measurement	A present	Before
Maintenance of Sanitary & Phytosanitary Standards (SPS) & Maximum Residual Levels (MRL) in produce.	Use of harmful preservatives for vegetable & fish			
	Formalin	Appropriate Unit		
	Carbamite	"		
Contamination during supply chain	Harmful Chemicals for ripening/ coloring	"		
Processing & Transportation	Use of dirty packaging materials, dirty water for washing or watering leafy & other vegetables	"		

Training			
Activities	**At present**	**Before**	**Remarks**
No. of training on safe use of pesticides Received			
No. of training on bio-safety Received			
No. of training on Sanitary and Phyto-sanitary (SPS) Received			

Any other observations: _____

Monitoring by (Name, Designation, Signature, Date): _____
Reviewed by (Name, Designation, Signature, Date): _____

Annex 11: Environmental Monitoring for Agricultural Research

Part A: General Description

Monitoring date: _____
Project ID No. (Concept Note / Full Research Proposal): _____
Title of the Project: _____
Location: _____

Brief description about the sub-project:

_____
_____
_____

Part B: Monitoring Indicators

S.No.	*Environmental issue*	*Indicator*	*Base line*	*Measurement*	*Change*
1	Biodiversity	Varieties preserved		Number	
		Local varieties used in breeding program		"	
		Varieties preserved *in situ*		"	
2	Soil Quality	Organic matter content		%	
		Soil samples tested		%	
		Types of efficient composting techniques		Number	
		Types of bio-fertilizers developed / documented		Number	
3	Pest control	Pest tolerant varieties developed		Number	
4	Soil Salinity	Salinity tolerant varieties released		Number	
5	Arsenic contamination	Water samples tested		Number	

Any other observations:

_____

Monitoring by (Name, Designation, Signature, Date): _____
Reviewed by (Name, Designation, Signature, Date): _____

Annex 12: Environmental Impact Monitoring for Agricultural Extension (Crop)

Part A: General Description

Monitoring date: _____
Project ID No. (Concept Note / Full Research Proposal): _____
Title of the Project: _____
Location: _____
Brief description about the sub-project:
_____
_____
_____
_____

Part B: Monitoring Indicators

S. No	*Environmental issue*	*Indicator*	*Base line*	*Measurement*	*Change*
1	Biodiversity	Traditional varieties grown		Number	
		Hybrid varieties grown		Number	
2	Soil Quality	Area under organic manuring		Acres	
		Area under green manure		Acres	
		Area under bio-fertilizer		Acres	
		Quantity of vermicompost used		Kg/acre	
		Quantity of chemical fertilizer used		Kg/acre	
		Area under diversified cropping system		Acres	
3	Pest control	Area under IPM		Acres	
		Quantity of chemical pesticides used		Litres/acre	
		Quantity of bio pesticides used		Litres/acre	
		Area under non-chemical pest management		Acres	
		No. of persons adopting safety measures while handling agro chemicals		% of farmers	
4	Soil Salinity	Area under rice-shrimp farming practice		Acres	
		Area under boro rice with brackish water		Acres	
5	Arsenic contamination	Families adopting rain water harvesting		% of families	
		Area switched over from ground water to surface water		Acres	
		Families practicing mitigation measures		% of families	

Any other observations:
_____

Monitoring by (Name, Designation, Signature, Date): _____
Reviewed by (Name, Designation, Signature, Date): _____

Annex 13: Formats for Detailed Environmental Assessment (DEA)

13.1 DEA on Agro-processing (Crops/Livestock/Fisheries)

Part A: General Description
DEA date: _____
Name of Upazila: _____
Name of district: _____
Name of sub-project being proposed: _____

Details of activities to be undertaken under the sub-project:

S. No.	*Activity*	*Description of activity (including details of scale in quantitative terms)*	*Cost*

(Note: Add rows as required, one row for each of the activities in the proposed sub-project)

Part B: Assessment of Negative Impacts of the Proposed Activities in the Sub-project.

B.1 Location of the unit

Where is the unit located (residential area, commercial area, industrial area, proximity to any water body)?

Does the location of the unit have the potential to cause any significant negative environmental impact?

B.2 Details of chemicals to be used in the agro-processing (including additives, colours , preservatives, etc.)

S. No.	*Name of chemical to be used (chemical name)*	*Is the use of this chemical permissible?*	*Is the use of this chemical non-permissible or banned?*

(Note: Add rows as required, one row for each of the chemicals to be used in the proposed sub-project)

B.3 Details of pesticides to be used in the agro-processing (including for storage)

S. No.	*Name of pesticide to be used*	*Is the use of this pesticide banned?*	*Does this pesticide belong to WHO classes Ia, Ib or II?*

(Note: Add rows as required, one row for each of the pesticides to be used in the proposed sub-project)

B.4 Details of water to be used in the agro-processing (including for production process, facility maintenance, etc.)

S. No.	*Source of water*	*Purpose of use (production process, cleaning of machinery, etc.)*	*Amount of water required (litres per day)*	*Does the water confirm to the prescribed standards?*

B.5 Water pollution

What are the potential sources of water pollution?

What is the amount of waste water generated in litres per day?

What is the potential severity of the water pollution (which parameters are likely to exceed prescribed standards)?

B.6 Air and noise pollution

What are the potential sources of air pollution in the production process (milling, de-husking, crushing, etc.)?

What is the potential scale and severity of the air pollution (which parameters are likely to exceed prescribed standards)?

What are the potential sources of noise pollution in the production process (milling, de-husking, crushing, etc.)?

What is the potential scale and severity of the noise pollution?

B.7 Solid waste generation

S. No.	*Nature of solid waste that will be generated*	*Amount of solid waste generated (kg per day)*	*Is this waste of a hazardous or toxic nature?*

B.8 Energy requirement

What is the energy consumption of the unit:
Electricity in kWh/annum: _____
Electricity in kWh/ton of produce: _____

B.9 Occupational health and safety hazards

What are the potential occupational health and safety risks?

B.10 Hygiene standards in processing

Are the prescribed hygiene standards followed by the workers involved in processing (hand wash, wearing masks and gloves, etc.)?

B.11 Any other significant environmental impacts, mention:

Part C: Environmental Management Plan for the Sub-project

Identified Mitigation Actions	*Implementation Schedule*	*Budget*	*Monitoring indicator*	*Monitoring frequency*
Location of unit				
Secure 'Location Clearance' from DoE				
Chemical use				
Review of production process and replacement of any non-permissible chemicals with safer, permissible alternatives				
Pesticide use				
Review of production process and replacement of any non-permissible pesticides with safer, permissible alternatives				
Water use				
Water quality testing to ensure conformity to prescribed standards Review of production process and introduction of water conservation practices				
Water pollution				
Effluent treatment to meet prescribed standards				
Air and noise pollution				
Review of production process and introduction of processes and equipment to meet prescribed standards of air quality and noise				
Solid waste generation				
Composting of organic waste Recycling or reuse of other wastes				
Energy requirement				
Review of production process and introduction of processes and equipment to enhance energy efficiency				
Occupational health and safety				

Review of production process and introduction of processes and equipment to enhance worker health and safety				
Hygiene standards in processing				
Review and strengthening of the hygiene standards followed by the workers				
Any other				

Prepared by (Name, Designation, Signature, Date): _____
Reviewed and Approved by (Name, Designation, Signature, Date): _____

13.2 Detailed Environmental Assessment (DEA) on Large Scale Cattle Farming

(DEA needed if cattle heads in urban areas above 10 and cattle heads in rural areas above 25)

Part A: General Description
DEA date: _____
Name of Upazila: _____
Name of district: _____
Name of sub-project being proposed: _____

Details of activities to be undertaken under the sub-project:

S. No.	*Activity*	*Description of activity (including details of scale in quantitative terms)*	*Cost*

(Note: Add rows as required, one row for each of the activities in the proposed sub-project)

Part B: Assessment of Negative Impacts of the Proposed Activities in the Sub-project.

B.1 Location of the unit

Where is the unit located (residential area, commercial area, industrial area, proximity to any water body)?

Does the location of the unit have the potential to cause any significant negative environmental impact?

B.2 Fodder requirement

What is the number of animals to be reared on the dairy farm?

What is the fodder requirement?

S. No.	*Type of fodder*	*Amount required (kg per day)*	*Source*
	Green fodder		
	Dry fodder		
	Concentrate feed		
	Any other		

B.3 Manure and waste management

S. No.	*Nature of material generated*	*Amount generated (kg or litre per day)*	*Method of management or disposal*
	Cattle dung		
	Cattle urine		
	Left over fodder and feed		
	Animal carcasses		
	Bio-medical wastes (medicine containers,		

	syringes, body fluid stained swabs, etc.)		
	Any other		

B.4 Water use

S. No.	*Source of water*	*Purpose of use (drinking water for animals, cleaning of animals, equipment, premises, etc.)*	*Amount of water required (litres per day)*	*Does the water confirm to the prescribed standards?*

B.5 Water pollution

What are the potential sources of water pollution?

What is the amount of waste water generated in litres per day?

What is the potential severity of the water pollution (which parameters are likely to exceed prescribed standards)?

B.6 Occupational health and safety hazards

What are the potential occupational health and safety risks?

B.7 Any other significant environmental impacts, mention:

Part C: Environmental Management Plan for the Sub-project

Identified Mitigation Actions	*Implementation Schedule*	*Budget*	*Monitoring indicator*	*Monitoring frequency*
Location of unit				
Secure 'Location Clearance' from DoE				
Fodder management				
Fodder cultivation Chaff cutter Other measures:				
Drug/chemical/pesticide use				
Review of production process and removal of any non-permissible drugs, pesticides and chemicals				
Water use				

Water quality testing to ensure conformity to prescribed standards Review of production process and introduction of water conservation practices				
Water pollution				
Effluent treatment to meet prescribed standards				
Manure and waste management				
Composting of manure and waste fodder Biogas plant Disposal of animal carcasses as per prescribed procedures and standards Disposal of bio-medical wastes as per prescribed procedures and standards				
Occupational health and safety				
Review of production process and introduction of processes and equipment to enhance worker health and safety				
Any other				

Prepared by (Name, Designation, Signature, Date): _____
Reviewed and Approved by (Name, Designation, Signature, Date): _____

Annex 14: Terms of Reference for External Environmental Audit

Objectives:
Objectives of external audit are to verify/check the following:

- To check the compliance with the system and procedures detailed in the Environmental Management Framework.
- To check the quality of the design, implementation and effectiveness of the Sub-project Environmental Management Plans (S-EMPs).
- To assess the effectiveness of the NATP's environmental monitoring.
- To assess the effectiveness of the capacity building initiatives on environmental management.

Scope:
The scope of the audit will include sub-projects all 4 sectors: Agriculture, Livestock, Fisheries and Research. It will also cover all the various activities supported under the NATP including institutional strengthening, support to CIGs/POs/SMEs, research proposals, etc.

Frequency:
External audit will be carried out prior to the mid-term review and once prior to the project completion. The audit will include both field visits as well as a desk review. The external audit will be done by a technically competent agency appointed by the PMCU for the NATP as a whole.

Methodology:

- Desk review: The desk review will focus on reviewing available documents and data with reference to the objectives and selected indicators.
- Field visits: Site visits and field level consultations will be organized for a sample of sub-projects to check (a) the quality of the design, implementation and effectiveness of the Sub-project Environmental Management Plans, and, (b) to check the quality of implementation and effectiveness of the environmental mitigation measures and enhancement measures.

The sample will cover at least 50% of sub-projects requiring Detailed Environmental Assessment and 20% of sub-projects requiring Limited Environmental Assessment. The sample will be representative in terms of the nature of the activities supported and will include agriculture, livestock, fisheries and research interventions.

Report of Audit:
A detailed report of the external audit must be submitted to the PMCU for action. The report must include the following:

- Description of methodology including details of sampling
- Review of the following (implementation and issues):
    - Effectiveness of the system and procedures in identifying issues and implementing appropriate mitigation measures.

    - Institutional arrangements for implementation of the EMP.
    - Capacity building on the EMP.
- Overall environmental performance of the NATP with respect to identified performance indicators.
- Recommendations for strengthening the environmental management system.
- Individual reports of the field visits undertaken.

Annex 15: Special Environmental Clauses (SECs) for Tender Document

Apart from the provisions under 'General Specification' and 'Particular Specification' for different sub-project components, the following special environmental clauses (SECs) shall be included in the Tender Document under General/Particular Specification. These clauses are aimed at ensuring that the Contractor carries out his responsibility of implementing the EMP and other environmental and safety measures.

Environmental Management Plan (EMP):
The Contractor shall carry out all mitigation and enhancement measures (including those related to mitigation of air/noise/water pollution; drainage/traffic congestion) as specified in the Environmental Management Plan (EMP), annexed to this Contract.

Temporary Works:
The Contractor shall make sure that all equipment and safeguards required for the construction work such as temporary stair, ladder, ramp, scaffold, hoist, run away, barricade, chute, lift, etc. are substantially constructed and erected, so as not to create any unsafe situation for the workmen using them or the workmen and general public passing under, on or near them.

Health and Safety:

- The Contractor shall observe and maintain standards of Health and Safety towards all of his employees not less than those laid down by the national standards or statutory regulations.
- Where appropriate, to prevent workers falling from heights, the Contractor shall make sure that every temporary floor openings shall either have railing of at least 900 mm height or shall be constantly attended; every floor hole shall be guarded by either a railing or a hinged cover, or constantly attended; every stairway floor opening shall be guarded by railing at least 900 mm high on the exposed sides; every ladder way floor opening or platform shall be guarded by a guard railing; every open sided floor or platform 1.2 m or more above adjacent ground level shall be guarded by a railing on all open sides.
- The Contractor shall provide all appropriate protective clothing and equipment for the work to be done and ensure its proper use. Where required, safety nets, belts, harnesses and lines shall be provided by the contractor. The "safety directives for work equipment" and "safety directives for protective gears", as specified in the Occupational Health and Safety Guidelines (attached) shall be followed.
- The Contractor shall provide and maintain in prominent and well-marked positions all necessary first-aid equipment, medical supplies and other related facilities. A sufficient number of trained personnel will be required to be available at all times to render first aid.
- The Contractor must provide or ensure that appropriate safety and/or health signs are in place at their work sites where hazards cannot be avoided or reduced.
- The Contractor shall report to the Engineer promptly and in writing particulars of any accident or unusual or unforeseen occurrences on the site, whether these are likely to affect progress of the work or not.

Disposal and Pollution:

- The Contractor shall not dispose any waste, rubbish or offensive matter in any place not approved by the Engineer or Statutory Authority having jurisdiction. The Contractor shall not discharge into any watercourse oil, solids, noxious or floating materials.
- The Contractor shall take all reasonable precautions to keep public or private roads clean of any spillage or droppings from his vehicles or equipment. Any spillage or droppings which accrue shall be cleaned without delay to the satisfaction of the Engineer.
- The Contractor shall construct sanitary latrine or septic tank system or install portable cabin toilet for disposal of human waste in the site office and temporary labor sheds for workers/ employees; the Contractor shall provide waste bins/ cans for collection of solid waste at appropriate locations (as directed by the Engineer), and ensure proper transfer/ disposal of solid waste with support from the local government authority (Pourashava or City Corporation).

Earthworks:

- During excavation of trenches in natural soils, the Contractor shall make sure that the first 300 mm to 450 mm of topsoil be excavated and stored on one side of the trench and the rest of the excavated soil is stored separately/ on the other side; during back filling of trench, the topsoil should be placed on the top again.

Annex 16: Report on Public Consultations

Places of Consultation
Consultations were held at:

- NATP-1 sites like Upazila Agriculture Offices at Belabo Upazila of Narsindi District and Kapasia Upazila of Gazipur District (ANNEX-2 and ANNEX-3 of Vol. II of EMF: Pest Management Plan);
- Detailed discussions were held with the concerned officers of DAE, DLS, DOF and NATP-1, SAAOs, CEALs and LEAFs attached with FIACs, CIGs and farmers of the groups like Crops, Vegetables, Fruits, Fisheries and Livestock.

Belabo Upazila of Narsigdi District: 30 September, 2014

Visit to Upazila Agriculture Office:
Discussions with the Upazila Officers, NATP-1 Officers and farmers helped in getting some general information with regard to the following issues having relation to various aspects of EMF preparation.

DAE:

- AWD Irrigation system in Boro Season increased yield by about 10% and saved Tk. 500/- per bigha (0.33 acre).
- Demonstration of yield gap minimization procedures showed 20% yield increase
- Fruit gardening: Engaged women and ensured cash in hand.
- Pesticide free vegetable production: Cost reduced 20%, yield increased 15%.
- Irrigation water from shallow tube-wells contains quite excessive amount of iron but there is no problem of Arsenic in it.
- HYVs of Rice, Jute, Bitter Gourd and other vegetables as well as Mustard grown.
- Chemical fertilizers used are: Urea, NPK, Sulfur, Zinc and Gypsum.
- SAAOs/Dealers prescribe quantity of each fertilizer per bigha (0.33 acre) of land.
- Use of chemical fertilizers has increased due to cultivation of new high yielding varieties of crops promoted by NATP.
- Organic manures include cow-dung, litters and compost.
- Pest infestation on rice include Stem borer: Rice hispa, Brown plant hopper; on vegetables White fly, Stem & Fruit Borer.
- Knowledge of farmers on pesticides: names of pesticide specified for each of the insects and diseases, doses, dilution rates, times of application etc are told to them by the dealers. They also learnt from the trainings provided by the NATP-1.
- There is no soil testing facility for determining fertilizer need for growing various crops and vegetables.
- Spraying pesticides create health problems for the farmers on some occasions. Precautionary measures are either not known fully or not followed due to carelessness.
- Home gardening: ensures some small income, family nutrition, women engagement.

DLS:

Discussion meetings of the livestock CIGs were arranged by the Community Extension Agent for Livestock (CEAL), on issues like cow rearing, broiler farming, cattle fattening and fodder cultivation. In summary, it may be stated that the farmers present responded positively regarding the outcome of the meetings and stated beneficial effects on their activities.

DOF:
The Community Extension Agents for Fisheries (CEALs) transferred knowledge of species-wise fisheries technologies to the farmers:
The fish farmers informed that:

- All the local fish varieties have been decreasing slowly.
- The fish farmers blame the use of pesticides in crops and vegetables production for this decrease.
- The foreign breed of Pangash is the most predominating variety of fish in the market now.
- Fertilizers used in ponds include urea, TSP, oilcake and rice bran.
- Deficit of oxygen in pond water was recognized by all the fish farmers present.
- Fish farmers obtained occasional counseling from the Local Extension Agents for Fisheries (LEAF) for mitigating the problems encountered.
- Fish farmers obtained training from NATP-1 staff/ DOF staff.
- The LEAF staff desired higher allowance per month as well as regular payment. Some did not get salary for 3 months.

HORTEX:

- Community Collection and Market Centers (CCMC) established by NATP-1 have been highly beneficial to the CIG farmers.
- They sell their commodities to the exporters directly without going through the middlemen.
- This way they get higher price of their commodities rather than selling to individual customers.
- The trolleys, vans, washing containers and mats supplied by NATP-1 helped farmers in reducing the post-harvest loss of vegetable considerably.

Visit to CIG:
Baroicha Uttarpara village, Block Char Amlabo.

- The CIG was formed jointly by the DAE and NATP-1.
- The dream/purpose has been fulfilled partly; savings increased and technology learnt partially through Demo &Training, 90 kg of fertilizer was given free of cost.
- Supply of trolley & washing container by HORTEX has been highly beneficial.

Kapasia Upazila of Gazipur District: 14 October, 2014

Visit to Kapasia Upazila Agriculture Office
Consultation meeting with Toknagar Women Crop CIG at Kapasia upazila, Gazipur.
Consultation meeting with Noya Sangoni Fisheries CIG at Kapasia upazila, Gazipur.

Consultation meeting with Upazila personnels of DAE, Livestock, Fisheries and SCDC at Upazila Agriculture Office, Kapasia, Gazipur.


Consultation meeting with Upazila personnel of DAE, Livestock, Fisheries, SCDC and Baroicha Uttar Para Crop CIG at Upazila Agriculture Office, Belabo, Narshingdi.

(1) Problem in Registering CIGs
Not all the members of CIGs are interested in saving money. As a result, some CIGs cannot be registered due to lack of savings. The "one Home one Farm Project" of DAE provides better incentives. The CIG Members are demanding similar incentives also from the NATP-1.

(2) Activities Carried Out
- Arranged Motivational Tours.
- Conducted 17 Training Courses.
- Established Demonstrations on 18 Improved Technologies.

(3) Information of Supply Chain Development Component (SCDC)
- CIG number 20 (3 for Banana, 3 for Dairy cows and 14 for Guava).
- There are 4 Commodity Collection and Marketing Centers. (One in Govt. land and three in rented houses).
- Produce supplied from SCDC: Banana and Guava.
- Benefits accrued from the SCDC formed by HORTEX:
    - Post-harvest loss has decreased about 5-10%.
    - Farmers' income has increased because their earlier practice was advance selling of gardens to other parties at lower prices due to difficulties of carrying and selling fruits in distant markets.

(4) Achievements so far
- Number of irrigation decreased from 15 to 12 due to use of Alternate Wetting and Drying (AWD) system in the *BORO* season.
- Introduction of AWD system decreased cost of irrigation by Tk. 350/- per bigha of land.
- Quantity of compost making has almost doubled due to NATP-1 intervention.
- AWD irrigation increased rice yield by about 10%.

- Amount of urea used has been decreased substantially.
- Pesticide use has decreased dramatically after introduction of sex pheromone for insect control by NATP-1 Project.
- Use of balanced fertilizer got momentum among the CIG farmers compared to the non-CIG farmers.
- CIG farmers started using increased quantities of farmyard manure than the pre-NATP time.

Consultation meeting with Toknagar Women Crop CIG at Kapasia upazila, Gazipur.

Visit to Village Toknagar

- CIG of Female Vegetable Farmers. No of CIG members 20, all of them grow vegetables.
- The CIG members are very enthusiastic in saving money, saved Tk. 80,000.00 already.
- They have taken land on lease in the name of the CIG by using the savings.
- They also gave loan to non-CIG farmers in lieu of interest per year.
- Emergency loan is provided to CIG members without interest.
- Received training on Vegetable Cultivation Methods including fertilization, pest management etc.
- Used biopesticides (*Neem* leaves, *Bishkantali* leaves, and seed of *Mehogani* etc) and less of pesticides.
- Received higher yield than before.
- Used own seeds collected from local varieties grown by themselves, very little hybrid seeds because hybrid vegetables fetch lower price in the market due to different taste than the indigenous verities.

Suggestions of the CIG members

- No. of members in the CIG should be increased from 20 to 30 for increasing amount of savings.
- Number of demonstrations should be increased.
- Need further trainings, especially in seed production, processing and preservation.

Consultation meeting with Noya Sangoni Fisheries CIG at Kapasia upazila, Gazipur.

Visit to Village Noyashangun

- CIG members 20 (17 male + 3 female), 14 out of 20 are Fisheries members, CIG formed in 2011.
- Fish farming in ponds (by 3 women members who apply feed to fishes).
- Fish farming in Beels (marshland, swamp) by a few on share basis with land owners in the Beel.
- Sores/wounds are the only disease that the fishes are attacked with.
- A chemical called Gastop + Urea + TSP + Cow dung are applied to improve Oxygen content of water in the ponds and Beels.
- Remuneration of LEAFs is BDT 1000 per month. In addition, payment is irregular, did not get salary during last two months. No other source of income.

Observations made by the Consultant:
Since LEAFs have complained about very little remuneration and its irregular payment in more than one place, the following suggestions are made:

(1) Allowance for the officers connected with the Demonstrations and Trainings need to be increased.
(2) Monthly allowance for the LEAF staff is really too small. They do not get any fees from fish farmers. The CEALs also get little remuneration. However, they get some fees from livestock farmers for injections in cattle, goats, chicken, etc. In fact, allowance for both LEAFs and CEALs needs to be increased.

Visit to Promy Poultry Feed Mill

- Uses biogas from the litter of his Poultry Farm. This system should be encouraged among other poultry feed mills.
- Takes good care with respect to disease contamination in the feed.
- Adds minerals and vitamins in the feed.

Visit to Union Parishad

- Farmers Information & Advisory Centre (FIAC) is placed in this office.
- FIAC Conference day is held once in a week.
- 5 SAAOS + 1 CEAL + 1 LEAF constitute the Union Extension Facility Team (UEFT).
- U.P. Chairman and Members interact quite often with SAAOS, CEALs and LEAFs.
- U.P. Chairman acts as the Chairman and Head of UEFT acts as the Secretary during preparation of the Union Extension Plan (UEF).
- Micro plans of different CIGs are taken care of during preparation of the Union Extension Plan.

Suggestions made by the FIAC Members:

- There should be some separate funds for the meetings.
- Each FIAC should be given a computer, presently, only 100 FIACs received it.
- A Pest Museum should be established in each FIAC to improve the knowledge of farmers.
- Massive training programs should be organized for various groups of workers and farmers.
- Many more demonstrations are necessary.
- Training programs and workshops for SAAOs, LEAFs and CEALs should be organized because it is they who are in direct contact of the farmers of various groups.