

**WEST BENGAL
ACCELERATED DEVELOPMENT OF MINOR IRRIGATION PROJECT
WBADMIP PHASE-II**



**PROJECT IMPLEMENTATION PLAN (PIP)
Part-I Main Document
June 2024**

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**Implemented by
DEPARTMENT OF WATER RESOURCES INVESTIGATION AND DEVELOPMENT
GOVERNMENT OF WEST BENGAL**

Office of the Project Director WBADMIP, 5th Floor, ICMARD Building, Block- 14/2, CIT
Scheme-VIII (M), Ulta Danga, Kolkata-700 067, Telephone- +91-33-23567548/49

www.wbadmip.org

Abbreviations

ASS	Agricultural Support Services
COP26	26 th Session of Conference of Parties to UNFCCC
CAS	Country Assistance Strategy
CSA	Climate Smart Agriculture
DLIC	District Level Implementation Committee
DPMU	District Project Management Unit
DPR	Detailed Project Report
DTW	Deep Tube Well
DWRID	Department of Water Resource Investigations and Development
EA	Environmental Assessment
EE	Executive Engineer
EiC	Engineer- in- Chief
EMF	Environmental management
EMP	Environmental Management Plan
EWP	Economic Water Productivity
FCA	Fisher's Community Association
FIG	Farmer Interest Group
FY	Fiscal Year
FM	Financial Management
FPC	Farmer Producer Companies
FPO	Farmer Producer Organization
GAP	Good Agriculture Practice
GAAP	Governance and Accountability Action Plan
GoI	Government of India
GoWB	Government of West Bengal
IA	Implementing Agency
IBRD	International Bank for Reconstruction and Development
ICB	International Competitive Bidding
ICR	Implementation Completion Report
IDA	International Development Association
IFR	Interim Financial Reports
INR	Indian Rupees
LA	Loan Agreement
LDP	Livelihood Development Plan
LDTW	Light Duty Deep Tube Well
MDTW	Medium Duty Deep Tube Well
MIS	Management Information System
ML	Monitoring & Learning
M&E	Monitoring & Evaluation
MLE	Monitoring, Learning and Evaluation
NCB	National Competitive Bidding
NDC	Nationally Determined Contribution
MOM	Management, operation, and Maintenance
MT	Metric Ton
PD	Project Director
PFMA	Public Financial Management and Accountability
PIM	Participatory Irrigation Management
PIP	Project Implementation Plan
PMU	Project Management Unit

PSC	Project Steering Committee
PWP	Physical Water Productivity
QA&A	Quality Audit & Assurance
RAP	Resettlement Action Plan
RLI	River Lift Irrigation
RPF	Resettlement Policy Framework
SA	Social Assessment
SDMP	Scheme Development and Management Plan
SBD	Standard Bidding Document
SE	Superintending Engineer
SFAA	State Financial Accountability Assessment
SFMIS	Surface Flow Minor Irrigation Scheme
SO	Support Organization
SPMU	State Project Management Unit
STW	Shallow Tube Well
ToR	Terms of Reference
UNFCCC	United Nations Framework Convention on Climate Change
WBADMI	West Bengal Accelerated Development of Minor Irrigation Project
WUA	Water User Association

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1. ABOUT THE PIP

At the request of Government of West Bengal and in agreement with Government of India, the World Bank is extending financial and technical support to implement the West Bengal Accelerated Development of Minor Irrigation Project Phase-II. The project will synergise the investments and achievements of the Phase-I as a follow-on activity. This Project Operational PIP (PIP) is prepared by DWRID, Government of West Bengal in consultation and concurrence with the World Bank. The project implementation will be in accordance with a Financing Agreement (FA) dated 16th September 2023, signed between the Government of India, World Bank to which Government of West Bengal is also a party.

1.1 Purpose of PIP

The PIP is the main guidance and basic reference document outlining the operational policies, implementation structure and management processes for implementing the project. As required under the FA, the Government of West Bengal, prepared this PIP in accordance with which the project will be carried out.

1.2 Overall structure and Content

The PIP outlines, among other things, the detailed implementation arrangements, specific activities, financial management, procurement methods and procedures, environmental and social safeguards standards and the steps and tasks to be followed in implementing the project. The main structure of the PIP is as follows:

- (i) The overall Project Description;
- (ii) Detailed description of the Project Components;
- (iii) Project Implementation arrangements;
- (iv) Financial Management arrangements;
- (v) Procurement Management arrangements;
- (vi) Environmental and Social Standards;
- (vii) Implementation Processes and activity steps;
- (viii) Monitoring and Evaluation arrangements;
- (ix) Corruption and Fraud Mitigation measures; and
- (x) Grievance Redress Mechanism.

1.3 Target Audience

The PIP is mainly meant to provide operational guidance and main basis of reference to the following stakeholders of the project:

- (i) All implementing agencies, entities and institutions at all levels of project implementation including the Project Management Units (PMUs) at state and district levels;
- (ii) Farmer institutions and other community organizations of project beneficiaries at scheme, village or at federated levels including Water User Associations (WUAs) collaborating in the project implementation;
- (iii) All staff members permanently or temporarily engaged in Project Implementation at all levels;
- (iv) All consultants, contractors, suppliers and other service providers associated with the project implementation; and
- (v) Civil society organizations (CSO), Non-governmental Organizations (NGOs) and similar other institutions or individuals directly or indirectly involved in the implementation of the project.

1.4 Applicable Rules

The PIP is developed from the WBADMIP Phase-II Project Design Document-the Project Appraisal Document (PAD) dated..... The PIP is prepared based on various applicable guidelines of GOI, GoWB and those of the World Bank. These include environmental and social framework guidelines, procurement guidelines, FM guidelines, Participatory Irrigation Management guidelines, guidelines on Water User Associations, guidelines on watershed development, irrigation management etc.

1.5 Uses and Limitations of the PIP

The project is to be implemented in accordance with the detailed provisions set forth in the PIP. It will be the principal document on operational policies, implementation procedures and other rules and guidelines for WBADMIP Phase-II. The PIP shall be used in conjunction with

- (i) Project Appraisal Document; and
- (ii) Financing Agreement dated_/_/_/2023

In case of any conflict between the provisions of the PIP and the Financing Agreement, the provisions of the Financing agreement shall prevail.

1.6 Preparation, Ownership and Amendments

The PIP has been prepared by DWRID and submitted to the World Bank for prior review. The World Bank reviewed and exchanged views on the PIP with DWRID and was adopted by GoWB as approved by the World Bank.

The GoWB, DWRID or other stakeholders shall comply with the provisions provided in the PIP while implementing the project and shall not amend, abrogate or waive any of the provisions of the PIP. Any amendments, suspensions, abrogation, repeal or waiver to the PIP shall be done with the prior agreement from the World Bank.

2. WEST BENGAL-SECTOR BACKGROUND

West Bengal is an eastern state, expanding from the Himalayas in the North to Bay of Bengal in the South. The state with a geographic area of 88,752 km² (2.7% of India's geographical area) is the 14th largest state in India. Among the states in India, West Bengal stands fourth in terms of population size and second in terms of population density. The population of the state is 96 million which is about 8 percent of the population of India and has a population density of 904 per km². The state is the 6th largest contributor to the nation's net domestic product.

2.1 Agriculture Sector

The state, by producing nearly 20 percent of the rice and 33 percent of potato production in the country is one of the most important food producing states in India. The Agricultural sector contributes an estimated 20 percent of Gross State Domestic Product (GSDP) and employs 55 percent of the work force. The total farm families in the state are estimated to be 7.1 million out of whom 96% are small and marginal farmers. The average size of land holding is only 0.77 ha.

The income of agriculture dependent households remains at INR 3,980 per month per household, far below the national average of INR 6,426 per month per household. Enhancing the farm household income through high value cropping, commercial farming and increase in cropping intensities are constrained by poor surface water availability and irrigation anomalies. Use of ground water pushes up the cost of cultivation and raises sustainability issues. In addition, fragmented farm lands with over 90 percent of the farm size being either marginal (less than 1 ha.) or small holdings (less than 2 ha.) coupled with very limited scope for increasing cultivated areas also hinder developments in the sector.

2.2 Poverty Status

The incidence of poverty in the state is closer to the national average (22 percent), with 20 percent of the population living below poverty line. Some of the districts situated in the western drier areas of the state have varying poverty levels ranging up to 38 percent. The state shelters the fourth largest absolute number of poor among the states in India.

2.3 Geology of the State

The topography, physiography and geology classify the state into six major regions:

- (i) Northern Hilly Region (2.5%);
- (ii) Terai-Teesta Flood Plain (13%);
- (iii) Gangetic Flood Plain (21.5%);
- (iv) Vindhyan Old Alluvial Flood Plain (18%);
- (v) Undulating Lateritic (24%); and
- (vi) Coastal Flood Region (21%).

The northern hill region of the state is embedded in the Eastern Himalayas. Discrete from the Himalayas, the narrow terai region transcend towards the Ganga delta in the South. The coastal region in the extreme south is interspersed with Sundarbans mangrove forests as a geographic landmark of the state. The western plateau and highlands present undulating lateritic dry zone areas of the state.

2.4 Water Resources

The state's average rainfall is estimated to be around 1500 mm annually ranging from 1300mm to 3700 mm. The maximum rainfall areas occur towards the northern parts, while the minimum rainfall areas are concentrated on the western parts and southern parts also receive good rainfall. There are spatial and temporal adversities in availability of water for agriculture. 76 percent of the annual rainfall is skewed towards three or four monsoon months (June to August). Bulk of the rainfall goes off to the sea as run off.

Of the three river basins of Ganga, Brahmaputra and Subarnarekha the state has nineteen sub basins. The total utilisable surface water in the state is estimated to be 58.8 billion M³. The rivers of West Bengal are divided into: (i) the rivers of North Bengal; (ii) the Ganga-Padma System; (iii) the Bhagirathi-Jalangi-Churni System; (iv) the western tributaries of Bhagirathi; and (v) the tidal creeks of Sundarbans.

The ground water availability is restricted in the regions of undulating lateritic west, northern hilly terai and coastal region. The current assessment of available ground water in the state is estimated to be 3.96-million-hectare meters. However, due to over exploitation with proliferation of tube wells, many areas of the state are under critical and semi critical conditions. In total the state uses only 18 percent (19.8 MCM) of its available water, while 91.7 BCM remain unutilised.

The northern and southern region of the state remain rich in ground water (29.33 BCM), but use in agriculture is unsystematic and unsustainable.

The Western districts remain the most water stressed with lowest rainfalls and scanty ground water resources and temperature raising as high as 45°C.

2.5 Land Use

The net area sown is about 5.3 million ha. As much as 26 percent of the cultivable area (15 million ha.) still remain rainfed. The land area under single crop cultivation is about 18.7 lakh ha. as per the latest land use and land cover of the state. Almost 75 percent of the single cropped area is in the lateritic western terranes and coastal regions. As high as 15 million ha., which is about 26 percent of the cultivable areas remain rainfed due to lack of irrigation system, concentrated in the dry western regions of the state.

2.6 Status of Irrigation

The state utilizes only 19.8 MCM (18%) of its available water resources, while 91.7 BCM remain unutilized. There is very little storage and no potential for creating additional storage. Out of the state's available surface water, only 11 percent is used through various storage structures. Over the years DWRID has developed minor irrigation schemes with a command area of about 2.4 million ha. The Government handed over all MI schemes to Water User Associations with the right to charge and use irrigation service fees. There exists vast potential for minor storage schemes harvesting abundant monsoon rainfall for use during the non-monsoon dry months.

3. WBADMI PROJECT-PHASE-I

The WBADMI Project -Phase-II builds on the success and achievements of a Phase-I of the project along with achievements under other projects implemented by the state including Jaltheertha and Matir-sristi.

3.1 Phase-I achievements

The state implemented from 2011 to 2019 the Phase-I of the WBADMI Project, successfully developing Minor Irrigation Schemes to enhance agriculture production. The community-based irrigation management model evolved under the project succeeded in supporting agricultural development and services encouraging crop diversification, adoption of new technologies including creating new income generating opportunities.

The project benefited 124,700 small and marginal farmers and share croppers.

The key outcomes of the project are summarized in Table-3.1

Table 3.1: Key Outcomes of WBADMI Phase-I

Sl. No	Key success	Achievements
1	Number of Water User Associations mobilized (WUAs) and strengthened	2,277
2	WUAs carrying out O&M of irrigation infrastructure	1,657
3	Proportion of WUAs generating at least 80% of resources required to manage operate and maintain schemes	72%
4	Number of water users provided with irrigation and drainage services	107,458
5	Number of female water users	13,579
6	Percentage of tribal farmers among water users	13
7	Number of small and marginal farmers graduated as Community Service Providers (CSP)	288
8	Incremental median income generated by the project	USD 319/ha.
9	Increase in value of agriculture production in the project areas	288%
10	Increase in area provided with new irrigation and drainage services	67,594 ha.
11	Increase in cropping intensity	192%
12	Number of irrigation schemes developed	2,291

3.2 Main Learnings from WBADMI Phase-I

The main learnings under the project include:

- (i) Establishing and strengthening **Water User Associations** helped institutionalized participatory irrigation management;
- (ii) **Segmenting project areas** based on potential diversities and current status of irrigation was used for project interventions;
- (iii) **Tailored solutions** responding to agro-climatic constraints and community contexts-spring rejuvenation in northern hills, water harvesting structures in western water stressed areas, excavated natural creeks in the southern coastal lands;
- (iv) **Systematic site selection** for schemes by identifying geographic areas delineated as polygons;
- (v) Extensive **use of GIS and Remote Sensing (RS)** applications both for planning and monitoring;
- (vi) Balancing a mix of **structural and non-structural solutions** to enhance farm incomes;

- (vii) **Scheme Development and Management Plan (SDMP)** a farmer participatory and online design and development tool for irrigation services;
- (viii) **Clustering of schemes** for efficient management and optimum utilization of resources;
- (ix) **Cultivation of diversified high value crops** accelerated benefits in agriculture and fishery-based livelihood activity through improved seeds, small scale mechanisation, new adapted crops and varieties and improved access to markets;
- (x) **A web-based monitoring system** was used, consisting of remote sensing imageries and GIS-based visual information; and
- (xi) The project introduced 70% of project schemes in the five **focused districts** and concentrated on **water management and agri-business investments** in the rest.

3.3 Implementation Arrangement

The implementation agency for the project was DWRID with a multiskilled SPMU setup at the state level and District Project Management Units in implementing districts. Support Organizations were hired for mobilizing of farmers and other community support activities. The three-line departments of agriculture, horticulture and fisheries were represented within the project team. The Engineering and Technical Team was seconded from government staff while other skills were through personal hired as contract staff. The overall leadership and Project Director position were held by Principal Secretary, DWRIDD, Government of West Bengal. Small and marginal farmers who have successfully implemented PIM in their own villages were hired as Community Service Providers to support new and upcoming villages. The project also established strong partnership with private sector in technology support, input provision, linking with markets etc.

3.4 Other Project Impacts

Farmers in climate stressed and poverty-stricken areas of western districts have been able to build several water harvesting structures. The project touched upon the resilience capacities of farmers who started growing 2-3 times in a year. The structural and non-structural support to them in addition to improving self-confidence of rainfed farmers diversifying into high value and water saving crops. The two pronounced impacts especially among the rainfed farming areas which have become evident relates to improved nutrition and decreased migration.

3.5 Models of Participatory Irrigation Management

The Phase-I of the project evolved into five models of participatory irrigation management suiting the agro-ecological and geo-physical diversities of the state. These models helped tailor irrigation solutions to the socio-ecological realities and hydro-geological challenges prevailing across districts. The state is divided into five zones and each one evolved a distinctive model for planning, designing and implementing irrigation solutions. Intensive and innovative use of remote sensing and GIS became instrumental in developing these models. The agro-climatic variety existing in each of the zones required customization of MI solutions. The five zones and the emerging design and implementation model are:

- (i) Zone 1 Western Model – Red Lateritic Semi-Arid Zone;
- (ii) Zone 2 Coastal Model – Saline Coastal Zone;
- (iii) Zone 3 The Central Alluvial Model – Vindhyan-Gangetic Alluvial Flood Plain Zone;
- (iv) Zone 4 Upper Plateau Model – Terai-Teesta Alluvial Flood Plain Zone; and
- (v) Zone 5 Hilly Model – Hilly Zone.

3.6 Key Lessons from Phase-I

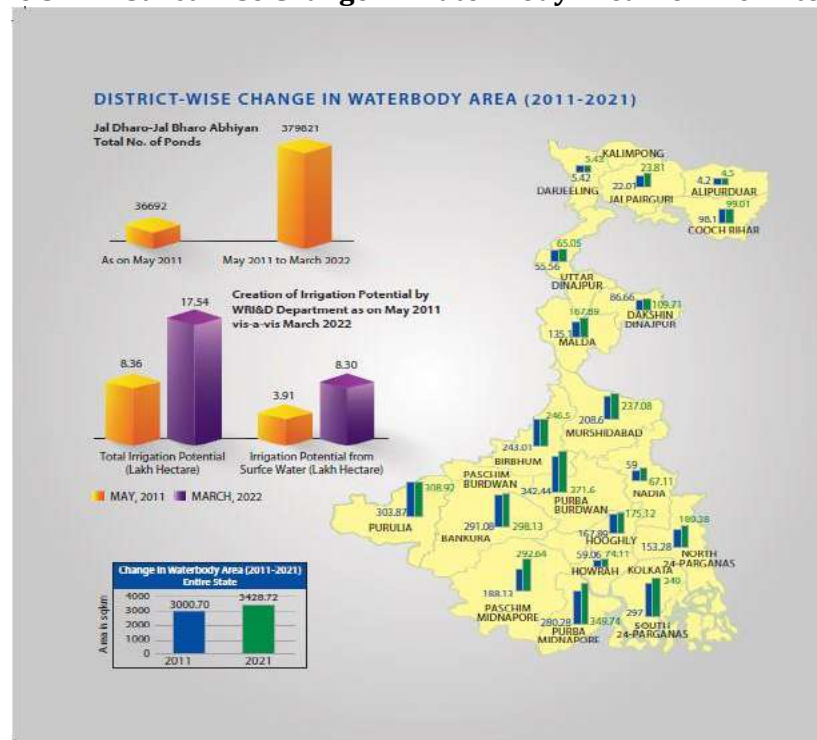
The project incorporates in itself the following key lessons emerging from implementation experience.

- First, irrigation infrastructure and soft support—such as institutional building agricultural support services—will be integrated in the Project. This approach is based on the experience that transitioning rain-fed farms to irrigation requires matters beyond infrastructure and is a gradual process, hinging on progressive experience accumulation and knowledge acquisition throughout the value chain.
- Second, the Project will institutionalize modern technology, such as GIS and remote sensing-based planning and monitoring in the department. It will facilitate various elements of the Project, including scheme site selection and clustering, customization of scheme design, real time monitoring of cropping patterns and moisture content, and sharing information and knowledge with remote farming communities.
- Third, Watershed or Scheme based Development and Management Plans will continue to be used in the Project. Different from traditional DPRs, DMPs would include O&M plans that clarify roles and responsibilities and delineate funding arrangements.
- Fourth, based on Phase I's success, the Project will keep focusing on empowering women through their participation as member and in leadership positions of WUA committees and training them on modern agricultural, horticultural, and fishery methods.

3.7 Change in Waterbody Area

The project has been able to increase the irrigation potential from 8.36 lakh Ha (May 2011) to 17.54 lakh Ha (March 2022). Similarly, the irrigation potential from surface water increased during the corresponding period from 3.91 lakh Ha to 8.30 lakh Ha. The number of ponds under Jal Dharo – Jal Bharo Abhiyan reached 3,79,821 during the period May 2011 to March 2022 from 36,692 ponds. The total change in water body area between 2011 to 2021 increased from 3000.70 sq. km to 3,428.72 sq. km. The district wise increase in water body area is shown in Figure 3.1.

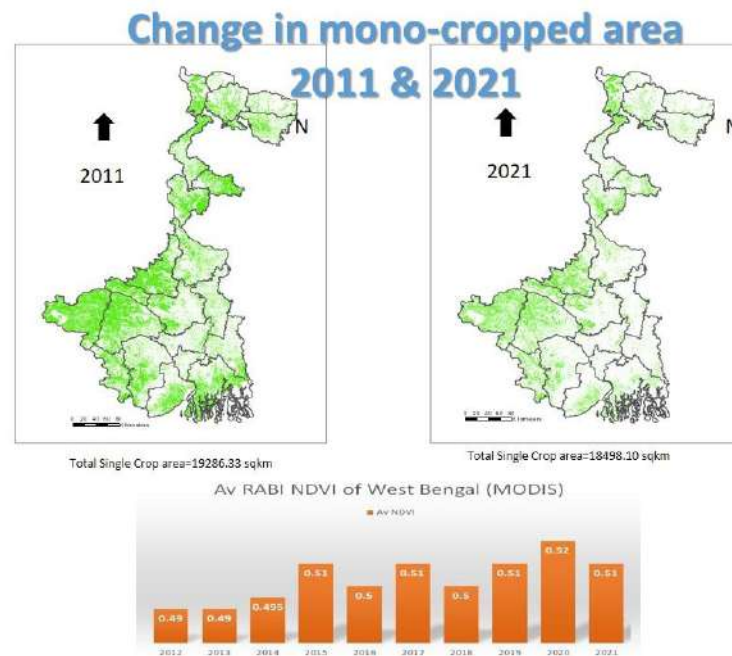
Figure 3.1: District wise Change in Water Body Area from 2011 to 2021



3.8 Reduction in Rainfed Mono Cropped Area

One of the outstanding achievements of the project has been clear targeting of irrigation schemes to rainfed mono cropped areas than duplicating efforts and investments in already irrigated belts. This is evidenced from the reduction in mono-cropped area over the period to 2011 to 2021, as shown in Figure 3.2.

Figure 3.2: Reduction in Rainfed Mono-Cropped Area from 2011 to 2021



3.9 Government Supported Phase

Post phase-I witnessed the Government fully owning and taking over the project activities even after conclusion of World Bank assistance. The entire project activities from closure of phase-I till the commencement of phase-II including project preparation support was fully financed by the Government budget. The institutional and implementation support to WUAs continued uninterrupted. During this interim phase the project initiated many pilots with success which will be scaled up during phase-II.

As on 1 June 2023 the total number of MI schemes approved increased to 5,022 with an outlay of INR 1,346.39 crores. The number of handed over schemes increased to 4,523 with CCA of 51,165 ha and an irrigation potential of 88,838 ha. The number of irrigation schemes developed increased from 2,277 at the closure of phase-I to 4,919, benefitting 1,35,470 farmers in 2,707 WUAs. The key outputs and outcomes of the Government supported phase are summarized in Table 3.2.

Table 3.2: Key Outcomes of WBADMI as on 1 June 2023

Sl. No	Key success	Achievements	Addition During Govt. Support
1	Number of Water User Associations mobilized (WUAs) and strengthened	2,707	430
2	WUAs carrying out O&M of irrigation infrastructure	2,707	1,050
3	Number of WUAs generating at least 80% of resources required to manage operate and maintain schemes	2,510	870
4	Number of water users provided with irrigation and drainage services	1,35,470	28,012
5	Number of female water users	24,832	11,253
6	Percentage of tribal farmers among water users	15.92	2.92
7	Increase in area provided with new irrigation and drainage services	92,284 ha.	24,690
8	Number of irrigation schemes developed	4,919	2,628

Source: Statistics compiled by SPMU

4. PROJECT DESCRIPTION

The Phase-II of WBADMI project as a follow-on activity of the Phase-I will further promote more resource efficient, inclusive and diversified growth in the rural farming sector. By addressing increased agricultural productivity through provision of assured irrigation, the project will booster climate resilience, water efficiency, sustainable productivity increase, value addition and income improvement for the rural population from agriculture. The project will also target gender equality and empowerment by addressing gender-related concerns in the irrigated agriculture in the state.

4.1 Project Development Objectives

The PDO is to augment water availability and strengthen water user groups for improved irrigated agriculture in project areas of West Bengal. They will be evaluated against the following PDO-level indicators:

- (i) Water harnessed through new irrigation schemes (cubic meters [CM] per year);
- (ii) Beneficiaries provided with improved irrigated agriculture and allied services (number)
 - Of whom are small and marginal farmers (percentage);
 - Of whom are farmers belonging to tribal communities (percentage)
 - Of whom are female farmers (percentage)
- (iii) Well performing WUAs operating and maintaining irrigation schemes successfully (percentage);
- (iv) Value-weighted index¹ for agricultural outputs (fixed base price) (percentage).

4.2 Key Project Principles

The project will be implemented following the key principles described below.

- (i) **Scaling up the home grown models** evolved under phase 1 which include:
 - Systematically targeting water constrained areas with irrigation services;
 - Utilizing GIS and remote sensing;
 - Innovations in cost effective, sustainable and affordable technologies and designs; and
 - Participatory planning and implementation methodologies meeting farmer demands.
- (ii) **Balancing investments in irrigation infrastructure with agriculture support services and farmer institution building.** Consolidating the newly brought in irrigated areas under Phase- 1 through Adoption of an adequate mix of investments in irrigation infrastructure development including continued maintenance of existing ones along with agriculture support services and institution building;
- (iii) **Deepening institutional sustainability** and broadening roles Farmer mobilization and participatory engagement of inclusive Water User Association (WUA) in advanced water management approaches including scheme designs and community contribution to capital investment and O&M;

¹ This composite indicator will account for intensification, diversification to high-value crops, and productivity, estimated as the ratio of the composite value at post implementation and baseline. The unit price of each commodity will be fixed at base price so that price inflation will not affect the indicator. Where, VWI: Value weighted index, A=area, Y=yield and P=Price of commodity, n=type of commodities and t=year of measurement post project and 0 is baseline.

$$VWI = \frac{\sum_{i=1}^n (A_{i,t} Y_{i,t} P_{i,0})}{\sum_{i=1}^n (A_{i,0} Y_{i,0} P_{i,0})}$$

(iv) Guaranteeing access to **water efficient technologies** and management systems to promote production, productivity, intensification and diversification of **agriculture, horticulture and fisheries** with focus on transforming rainfed to irrigated agriculture to less water intensive and high value operations.

4.3 Project Area

The project will cover the entire state of West Bengal. However, a segmented approach to tailor project intervention to suite the geo-climatological and agro-ecological zonation based on the five comprehensive models emerged from the phase 1 implementation will be resorted to. The project will implement most appropriate interventions considering the climatological, hydro geological and socio-economic peculiarities of the zones. The details of the five zones are in table 4.1.

Table 4.1: Geo-Climatological and Agro-Ecological Zonation of West Bengal

Sl. No	Zone Names	Project Districts
Zone 1	Western Model – Red lateritic semi-arid zone	Purulia, Paschim Medinipur, Bankura, Birbhum and Jhargram
Zone 2	Coastal Model – Saline Coastal Zone	24 Paraganas South, Purba121 Medinipur
Zone 3	The Central Alluvial Model – Vindhyan-Gangetic Alluvial Flood Plain Zone	Dinajpur, Dinajpur, Murshidabad, Malda, Nadia, 24 Paraganas North, Howrah, Hooghly, Bardhaman
Zone 4	Upper Plateau Model – Terai-Teesta Alluvial Flood Plain Zone	Kochbehar, Jalpaiguri, Alipurduar.
Zone 5	Hilly Model – Hilly Zone	Darjeeling, Kalimpong

4.4 Project Benefits and Beneficiaries

The project will benefit 1,65,000 farmers. This will include __ number of small and marginal farmers and __ number of women farmers. In addition, __ numbers will be tribal farmers.

The key benefits from the project are:

- (i) Benefits from the expansion of MI facilities;
- (ii) Higher income from crop yields, plantation, fish ponds through the intensification, diversification and commercialization of agriculture, horticulture and fisheries in the command areas of MI schemes;
- (iii) Savings in operating costs, less pollution and uninterrupted services by the use of solar pumping, adoption of irrigation efficient technologies like sprinkler and precision irrigation;
- (iv) Social empowerment through organizational benefits from WUA and farmer participation in decision making;
- (v) Enhanced coverage of most vulnerable farmers-marginal, small, women and tribal-through targeting of project areas covering single cropped, rainfed and socio-economically weaker pockets;
- (vi) Improved and sustainable irrigation services through use of innovative technologies like GIS, remote sensing, better design standards.

4.5 Selection Process and Criteria

The project will prioritize focus areas for project implementation in three stages: (i) assessment of irrigation need based on land use and cropping pattern, (ii) social targeting using socioeconomic parameters and (iii) logistic accessibility to cluster villages and delineate watershed boundaries.

5. COMPONENT A: STRENGTHENING COMMUNITY-BASED INSTITUTIONS

During phase I (2012-19) with World Bank support and also afterwards with GoWB directly supporting (2020-23), Water User Associations (WUAs) were established and strengthened which took over, managed, and maintained the minor irrigation services set up under the project. In 2021, third prize and all the three first, second and third prizes for the WUAs awarded by National Water Mission, Government of India (2022) were won by WUAs from the state is a strong testimony to their demonstrated strength and empowerment. The Phase-II will have a component on strengthening community-based institutions to support the new irrigation services to be set up as well as strengthening and networking the already formed WUAs.

Farmer Institutions during Phase-I

The Phase-I **institutionalized** participatory irrigation management through establishing and strengthening Water User Associations. The WUA (detailed in chapter 10) institutional and governance mechanisms helped build **confidence among farmers** and improved **ownership of irrigation schemes** thereby ensuring sustainable **operation and maintenance**. The project invested on developing operational guidelines and providing training and other capacity building efforts including norms and standards on computation of **water charges**. The WUAs evolved more than just management and operation of schemes to managing microenterprises, carrying out successful **economic enterprises** and also emerged as **rural agriculture hub** to provide farming inputs. The project also set in place a performance monitoring using **grading methodologies** (assessment for map attached in chapter 10.10) for WUAs. The project graded about 1,338 WUAs and only 260 and 181 belonged to the low performing C and D grades, respectively.

5.1 Key Lessons and Scaling up Strategies

The key lessons from the phase 1 and subsequent three years of state government funding relating to WUAs have been documented by the project and will be used for scaling up during phase II as summarized in Table 5.1.

Table 5.1 Main Lessons on WUA from phase I to be scaled up in phase II

No.	Main Lessons	Scaling up/Replication Strategies
1	Inclusive Farmer Mobilization Process model focusing on small and marginal farmers	• The WUA manual will be updated with the mobilization and strengthening methodologies and will be used for replication and scaling up in new scheme areas.
2	Women Participation with women membership in WUAs slightly less than one in five.	• Women membership will be enhanced to at least one and half in five (30%). • Women member of the WUA HH would be facilitated to take up suitable economic activities to augment their income, take part in WUA functioning and leadership • Agriculture Support Service plan will earmark some economic development activities for women SHGs who are connected to WUAs. WUA as per their choices may outsource these activities to the suitable SHG (s).
3	As Multipurpose, accountable and transparent farmer body -WUAs successfully taking over, managing and operating minor irrigation services including MI structure taking joint decisions on sharing of water,	• New WUAs will be mobilized and strengthened in all new project areas and new irrigation facilities

	formulating crop plans covering three crop cycles and considering availability of water, managing financial resources and accounting, adopting improved production practices, connecting with the markets etc.	
4	Demonstrated Financial sustainability by collecting water charges, generating surplus from economic and other collective actions to create corpus funds for its own operations and MOM.	• New WUAs will be strengthened to be financially sustainable. • Existing WUAs will be further strengthened to achieve financial sustainability
5	Light house' WUAs (well performing), often women, SC and ST led providing peer-to-peer support to other WUAs.	• A cluster approach to establish new WUAs in the accessible vicinity of existing WUAs to provide arm's length mentoring and handholding support from successful WUAs.
6	Existing matured first-generation WUAs Graduating into second-generation organization	• Support to maturing WUAs including ASS will be gradually tapered off, with exit of project support. • The second phase will promote graduation of all successful WUAs from phase I on a cluster basis within the district to form into second-generation institutions in line with Farmer Producer Companies (FPC). • Entrepreneur and well performing clusters will be facilitated to act as FPCs and rest will be facilitated to register under Societies Registration Act 1961 if required. It will be done as per choices of farmers within cluster • The FPCs will be professionally supported on organizational development and to aligning with market forces, procuring production inputs, collective marketing of produce etc. using better bargaining power and economies of scale.

5.2 Objectives of the Component

The objective of the Component is to facilitate mobilization and empowering farmers to form their own organizations of Water User Associations and meaningfully engaging them to design, plan and manage irrigation services and improved irrigated agricultural practices. The focus and main attention will be on pro-poor and vulnerable small farmers, marginal farmers and sharecroppers including women and tribal farmers. The activities will target the farmers in the climatologically stressed watersheds who are currently managing their livelihoods through rainfed, single-cropped subsistence farming.

The component will have three **sub-components**:

- (i) **Sub-component A.1: Mobilization and development of farmer institutions for new schemes;**
- (ii) **Sub-component A.2: Development and strengthening of farmer institutions for existing schemes; and**
- (iii) **Sub-component A.3: Organization development of WUAs through federated arrangements.**

5.3 Sub-Component A.1: Mobilization and Development of Farmer Institutions for new schemes

This sub component relates to farmer mobilization and institution building in new project areas where farmers are engaged to set up new irrigation services.

5.3.1 Objectives

The objectives of the sub component are:

- (i) To Identify, mobilize and build capacity of farmers benefiting from new and/or improved irrigation and drainage services under the project;
- (ii) Formation and development of Water User Associations as accountable, inclusive, transparent and sustainable institutions of farmers;
- (iii) Ensuring participation of small farmers, marginal farmers and share croppers in the design, implementation and continued management of irrigation and drainage services; and
- (iv) To Converge agriculture, horticulture and fisheries livelihood activities at the WUA level so as to efficiently manage the irrigation services and water resources.

The sub component activity will focus on mobilization and organization development of WUAs in prioritized watersheds for establishing new MI services.

5.3.2 Main expected Outcomes

The sub-component is expected to ensure continued use and enhanced maintenance of irrigation services in addition to, sustainable water resource management. The expected outcomes are measured:

- (i) Strengthened WUAs operating and managing irrigation services;
- (ii) Inclusive WUAs with small farmers, marginal farmers, share croppers, female members and tribal as members and they are also represented adequately in decision making bodies;
- (iii) Institutionally performing WUAs with regular meetings, maintaining minutes of decisions, maintaining books of accounts, membership register and other records, renewing registration of WUAs periodically etc.;
- (iv) Financially sustainable WUAs raising own revenue to meet operational expenses and maintenance charges; and
- (v) Improved governance of WUAs through democratic decision making, accountable leadership and transparency in functioning.

5.3.3 Component Activities

The main activities to be carried out under the sub-component are:

- (i) Updating WUA manual incorporating all lessons so far and reflecting the design for Phase- II;
- (ii) Engaging support organizations for sensitization and mobilization of farmers into WUAs and further organization development;
- (iii) Forming and registering along with renewal of WUAs;
- (iv) Capacity building of WUAs on organization development including resource planning;
- (v) Preparing participatory SDMP with the involvement of benefiting farmers including in the design of irrigation services;
- (vi) Supervising and assuring quality of SDMP implementation by WUAs;
- (vii) Capacity building of WUAs on MoM;
- (viii) Delivering irrigation services and participatory water resources management;
- (ix) Conducting meetings, maintaining books and records on WUA;
- (x) Converging and dovetailing agriculture support services activities through WUA; and

- (xi) Performance monitoring and grading of WUA.

5.3.4 WUA Formation and Adaptations

WUAs are mobilized and strengthened under the following situation:

- (i) Around proposed new MI schemes;
- (ii) Based on agricultural support services activities, when water conservation structures are created like 30:40 model cluster of Happa or through construction of MI schemes or both;
- (iii) Software activity support to WUAs when cluster of WDS (at least three) are created primarily for fisheries, promoting integrated agriculture, horticulture, fisheries and animal husbandry through convergence with government schemes, also promoting village based economic activities like bee keeping. Tussar (silk) producing etc.;
- (iv) Formation of WUA against a single WDS will not be encouraged taking into consideration the challenges associated with it i.e., a smaller number of members, possibility of family ownership, high running cost due to less membership, etc. Farmers will be encouraged to group into WUAs comprising multiple MI schemes located within a certain geographical radius taking into consideration the purpose and the mechanism for regular interface/ meeting, etc.
- (v) In situations of many schemes within a mouza, 'user groups' of scheme beneficiaries may be informally mobilized around each scheme and WUA is formed with representatives from user groups as a single registered WUA within the mouza

5.3.5 Focus Areas in WUA strengthening

Compared to Phase-I, the WUA strengthening during phase-II will implement the following improvements:

- (i) **Capacity Building for organization development:** More focus will be on institution development and capacity building of WUAs to emerge as 'one stop extension and input services' to farmers;
- (ii) **SHGs and WUA institutions Linkage:** Women Family members of benefiting farm families will be who are also the members under SHGs will be supported to take up diversified livelihood activities. They will be encouraged to participate in WUA functioning and leadership. Focus will be on inclusion of more SC/ ST women, etc.
- (iii) **Institutional graduation:** WUAs will be formed and strengthened as primary institutions which are later networked/graduated into second generation institutions and the likely option is Farmer Producers Company/Organizations;
- (iv) **Value added support services by WUA:** WUAs will be supported to initiate marketing of farm produces including fisheries, integrating forward and backward linkages and linkages and convergence with line departments;
- (v) **Clustering WUAs:** WUAs will be encouraged to work together as a cluster for achieving economies of scale in sourcing of inputs and collective marketing of produce;
- (vi) **Convergence with line department:** Linking with line department will ensure leverage benefits apart from project support. WUAs will be mobilized to act as catalyst to access various departmental program/schemes collectively for the benefit of WUA members. Convergence may take place with agriculture, horticulture, fishery, animal husbandry, backward classes welfare department, etc.
- (vii) **Advisory Services (Krishikatha) to Farmers through Mobile:** Krishikatha is a mobile based free advisory service on agriculture, horticulture, fishery, and other relevant areas, implemented by the WBADMI project. Farmers after registration in Krishikatha, start getting the season and crop wise weekly advisory and customized answer for problems of any crops including aquaculture within a time span of maximum 48 hours. Beside there is a provision for listening answer of the questions raised by the farmers from locality. All advisory and answers get stored and farmer may utilize the same as and when required basis.

This service develops a bond between project and farmers. Farmers' expectations have been surveyed periodically for more need based and appropriate advisory. Besides through SO follow ups of advisory is done, that further helps improve the quality of services. Effective engagement of farmers in Krishikatha using WUA platform may both way benefit farmers as well as project. Farmers' engagement through WUA has been elaborated in chapter 10.

5.3.6 Seven Step Process for Formation and Development of WUA

The formation and development of new WUAs essentially comprise of a **Seven Step Institutional Process** which in turn is a sub-cycle of the Project Implementation Cycle.

The Seven Step WUA formation and development process consists of:

- (i) **Step 1:** Sensitizing and awareness building among farmers;
- (ii) **Step 2:** Mobilization and formation of WUA;
- (iii) **Step 3:** Participatory planning for irrigation services;
- (iv) **Step 4:** Participatory implementation of MI schemes;
- (v) **Step 5:** Management Operation and Maintenance (MOM);
- (vi) **Step 6:** Planning and supporting agriculture support services (ASS) related activities; and
- (vii) **Step 7:** Grading and Identifying Lighthouse WUAs.

• **Step 1: Sensitization and awareness building:** This is the first on site activity by the support organization, once a village is identified for project intervention and possible locations for siting MI schemes done by the engineering team. The activity ensures that farmers are engaged upfront in field level implementation which will enhance their ownership, interest and involvement to ensure sustainable use of the MI scheme. The SOs will organize tree planting, converting waste lands to fruit tree cultivation and other locally relevant activities as village entry level activities.

• **Step 2: Mobilization and formation of WUA:** This is the crucial step in carefully identifying all potential beneficiary farmers including all vulnerable sections like small farmers, marginal farmers, share croppers, women farmers and tribal farmers. PRA would be carried out and the resultant maps are converted into geo referenced map using mobile app for monitoring later for irrigation system planning and crop planning. The existing SHGs (within potential WUA household members) including those engaged in fisheries will be identified and mapped for link up with WUA. They are continuously engaged in collective activities, periodically informed and systematically empowered to form the WUA.

• **Step 3: Participatory planning for irrigation services:** This activity onwards there will be a strong convergence and collaboration with engineering processes and ensures that the proposed MI scheme is the 'best fit' irrigation solution considering the demands of the farmers and peculiarities of the area. The involvement and participation of the farmers ensure selection of affordable and sustainable options for MI design.

• **Step 4: Participatory implementation of MI schemes:** While contractors/service providers procured by the SPMU/DPMU will be undertaking construction and/or installation of MI schemes, beneficiary farmers are involved in monitoring and quality assurance. The farmer community represented through MC and SC by involving during the implementation become fully confident to take over the commissioned schemes.

• **Step 5: Management Operation and Maintenance (MOM):** The core purpose for which WUAs exists is to manage, operate and maintain the MI scheme set up under the project. WUAs take over the MI schemes along with governance rights of the water resources. The activity assumes significance as WUAs have to responsibly fix water charges and successfully collect it from all members. Water charges form the main source of revenue for WUAs and successful collection ensures financial sustainability of the WUAs.

• **Step 6: Planning and supporting Agriculture Support Service (ASS) related activities:** As WUAs begin delivery of irrigation services, the need for various support to strengthen agriculture, horticulture and fisheries activities emerge among beneficiary farmers. WUAs being organizations of beneficiary farmers have to support such demand from its members. The detailed tasks are described in the component description for livelihood development.

• **Step 7: Grading and Identifying Lighthouse WUAs:** This activity logically concludes with assessing the strengths and sustainability of the newly formed WUAs, extending additional support to weaker ones as well as transition itself also into sub-component (A.2). The detailed tasks and responsibilities for carrying out the activities are summarized in Table 5.2.

Table 5.2: Activity Mapping for WUA Mobilization and Development for new Schemes

Activity	Main Tasks	Responsibility	Key Output
Step 1: Sensitization and awareness building	- Locally relevant village entry activities - IEC Campaign on project - Awareness raising on sustainable use of water resource - Creating awareness about the project, its rules and implementation processes - Identification of MI scheme locations	SO, with the support from DPMU	- Expressed willingness among farmers to work together and collaborate with the project - Mass petition to DPMU requesting MI solution and abide by project requirements - MI scheme approved
Step 2: Mobilization and formation of WUA	- Identifying potential farmer beneficiaries (including fish farmers) of the proposed MI scheme - Village level training on rights and duties of members, sub-committee members and office bearers of WUA - Adopting bye laws - Selecting office bearers - Training office bearers and sub-committee members on their responsibilities - PRA and preparing geo referenced map - Mobilizing membership fees	SO, with the support from DPMU	- Fisheries interest group formed (FIG) or other groups formed - WUAs registered - Bank accounts opened, PAN card done - Geo referenced PRA map - Women representation in MC ensured

Activity	Main Tasks	Responsibility	Key Output
Step 3: Participatory planning for irrigation services	• Training MC and SC members on participatory SDMP preparations • Collecting data using PRA tools • Discussing and deciding on scheme type, technology options with farmers • Receiving farmers feedback on MI scheme aspects. • Discussing and approving SDMP finalized by DPMU by GB	• Management committee and works sub-committee facilitated by SO and mediated by DPMU	• Socio-economic and background information realistically collected and incorporated into SDMP • MC and SC members fully conversant with SDMP.
Step 4: Participatory implementation of MI schemes	• Training MC and SC on implementation supervision • Farmer monitoring of works and installations • Participating in QA/QC • Completing Okay cards	• MC and SC	• The MI schemes as planned has been constructed/installed • MC and SC members confident to take over management of MI scheme
Step 5: Management Operation and Maintenance (MOM)	• Training on MoM (including solar) • Deciding on operations arrangement • Facilitating preparation of crop plans/fisheries activities for individual farmers • Providing irrigation services as per the approved water budgeting and water distribution plan • Collecting water charges as per rates approved by GB • Maintaining books of accounts • Following up arrears in collection of water charges.	• MC and SC (Water Management)	• The MI assets are taken over, irrigation services delivered as per the approved schedules and water charges are collected as fixed by GB • Equitable and sustainable water resource utilization
Step 6: Planning agriculture support service (ASS) related activities	• Facilitating and linking with extension and input supplies • Crop planning/fisheries activities and adherence checking • Facilitating extension activities including demonstrations through FFS, FFD etc. • Facilitating supply of seeds, fertilizer and other inputs	• MC with the support from Agriculture Sub-Committee (ASC)	• Realization of incomes in the hands of member farmers through efficient utilization of irrigation services • Crop specific cost benefit analysis and accordingly crop planning • Adaptation and replication of good practices-tracking and recording

Activity	Main Tasks	Responsibility	Key Output
	- Facilitating organic based intervention - Facilitating crop diversification and promotion of oil seeds, pulses etc. intervention - Converging services to farmers from private sector and other agencies including marketing support		
Step 7: Graduation to second level organizational structure	- Grading and identifying 'light house' WUAs on an annual basis. - Tagging 'light house' WUAs with WUAs requiring additional handholding. - Other support to WUAs in the lower grades to improve their functioning and grading.	DPMU supported by MCs and farmer champions from 'light house' WUAs.	Significant majority of WUAs are rated A or B grade

5.3.7 SHG Linkage

The success of carrying out various economic activities by Self Help Groups (SHGs) like fishery, intercropping, plantation, sal leaf plate making, bee keeping etc. demonstrated during phase-I will be supported. It is expected that SHG linkage will help WUAs boost women participation up to 30%.

SHG & WUA working relationship: The relationship between SHG and WUA would be organic in nature. During Phase-II, membership of WUA will be considered as Household with single voting rights. That may create an ample opportunity for women counterpart of WUA HH to take part any economic activities as per their choices and scope of work at WUA end. It is most likely that the women members from WUA HH are part of any SHGs. Hence, if any WUA wish to outsource any activities, that could be done through these SHGs where there are member from WUA HH. Project may also earmark some activities targeting these SHGs.

Profit sharing mechanism: It is evident that in the whole value chain development process, presence of women as organized force is beneficial and, in the line, expertise and capacities of SHGs may be tapped. If WUA outsource any economic activities to SHGs as a whole or part of SHG members who are linked to WUA, then, out of the profit generated by the SHGs, at least 10% is contributed to WUA corpus based upon mutual decision.

Selection of best fitted SHG for outsource any activities: It could be happening that within a WUA there could be multiple SHGs who are linked to any single WUA. Under such circumstances, while outsourcing, WUA may choose the SHG based on the prioritization criteria like expertise, willingness, SHG grading rank, bank credit limit, loan repayment status, bonding within SHG, etc.

5.3.8 Phasing and Timeline for Implementation

All new WUAs have to be formed sufficiently early in the project so that there is enough time for mobilization and development. All MI schemes have to be accorded with work order within the first

three years of project initiation, so that the institution development and nurturing of WUAs happen before project exit.

The experience from Phase-I reveals that on an average three years is required for strengthening WUA especially in surface water schemes and another two years for developing value chain and linking up with markets. A total of five years support window will be provided to the new WUAs by the project. The timeline for mobilization and strengthening of new WUAs is also linked with the planning, design and implementation of irrigation facilities. Some of the surface water scheme types are found to take longer time to complete. The average duration for the overall project implementation cycle may take five years. The details of the timeline for undertaking the seven- step process for formation and development of WUA is given in Table-5.3.

Table 5.3: Timeline for Formation and Organization Development of WUAs

No.	Steps	Duration	Remarks
1	Sensitizing and awareness building among farmers	4 months	
2	Mobilization and formation of WUA	4 months	
3	Participatory planning for irrigation services	4 months	
4	Participatory implementation of MI schemes	12 months	Do not require the full complement of SO staff
5	Management Operation and Maintenance (MOM)	12 months	
6	Planning and supporting agriculture livelihood activities	36 months	Will happen in parallel with MOM
7	Grading, Identifying Lighthouse WUAs and project exit	6 months	Immediately after MOM

5.3.9 Capacity Building of WUAs

The capacity building on institution development will be segregated into:

- Orientation and structured learning programs for project personnel; and
- Capacity building at WUA level.

Project Level Structured Learning- The training on institutional development aspects for project level personnel is summarized in Table-5.4.

TABLE 5.4: Training for Project Personnel

Sl. No.	Target Group	Modalities	Topics Covered
1	SPMU/DPMU/SO Personnel	Online and classroom based including refresher training	WUA structure and functions
2	Community worker of SO	Annual orientation and thematic trainings	Project principles, WUA management
3	Subject expert DPMU/SOs	Classroom training and exposure training	Project management, documentation, thematic training

WUA level Capacity Building

All WUA level capacity building will follow on the job, on site, handholding type. The most common mode will be WUA to WUA type peer to peer learning mode.

Master Trainers: The aim is to identify and keep ready a pool of resource persons-master trainers who will handhold, provide services and train farmers in operation and maintenance, agriculture, horticulture, fisheries, produce handling and marketing etc. For building the capacity of master farmers, a ToT approach will be adopted. The broad topics on which master trainers will be developed which may include: Institution development aspects of WUA, governance and social accountability aspects, seed treatment by organic agents, Preparation of Organic bases a.

Trichoderma viridae b. Plasmodium c. Rhizobium, etc, Seed preservation methods, Organic based farming like Dhaincha, use of vermicompost, Azolla, vermicomposting, etc. SRI techniques, Pulses, Oil seed if required for specific types of pulses and oil seeds , Bee – keeping, etc, sal plate making, Plantation Management, Post-harvest Management, Seasonal vegetables – separately for Kharif/Rabi/Pre Kharif Season along with institutional strengthening related issues like collective water management , Upkeep and maintenance of MI scheme, water budgeting , calculation for fixing water charges , Maintenance of Pump, solar systems, financial management, record keeping etc.

Professional Institute/Organization: Professional training institutions (government and non-government), companies, KVKs etc. will be identified to develop master trainers in various thematic areas. The number of master trainers will be based on demands from the WUAs. The training may cover theoretical and practical capacity building over one month's time and successfully trained personnel will be provided with certificates. The identified institution will also train community workers in addition to providing orientation to DPMU/SO staff.

Curriculum Development: Training modules and curricula development will be spear headed by professional institutes with inputs from project team covering different thematic areas including institution development and engineering aspects.

CB plan and publication of training calendar: Each of the SO in consultation with DPMU will draw up the CB plan for supporting WUAs. The training institute will be responsible for drawing up a CB plan for each district and publish the overall training calendar. The training design will clearly indicate the thematic focus areas, target groups for each of the programs, number of persons to be covered, number of days of program.

Budgetary Support: The master trainers are eligible to receive an honorarium of Rs.500 to 700 per day or as approved by the project. Preparation of modules, curriculum development workshops, exposure visits, audio-visual material development and equipment will be supported by the project. All village level programs are zero budget for delivery, except resource person fee and equipment cost.

Monitoring Capacity Building: SOs will prepare capacity building reports also including participants' feedback. DPMU will check the quality of the CB activities on a random basis and consolidate CB reports. The professional institute/organization will undertake an annual evaluation of the CB activities and submit reports to SPMU. The subsequent years CB planning will incorporate the 'feedback loop' from the previous year and hold stakeholder workshop before finalizing.

5.4 Sub-Component A.2: Development and strengthening of Farmer Institutions for existing schemes

The need for the sub project activity emerges mainly on two accounts:

- (i) There are still some WUAs established during phase I requiring handholding and other support to be able to manage and sustain themselves; and
- (ii) There are many WUAs formed outside the project to whom irrigation installations are handed over without proper organization development and capacity building leading to under-utilization or non-utilization of the irrigation investments already made.

5.4.1 Objectives

The sub-component will focus on organization development of WUAs already formed during phase 1 and also revamping the WUAs in existing irrigation service facilities established outside the project. The component aims to ensure that almost all WUAs managing operation and maintenance of irrigation services fully mature as first-generation farmer institutions, financially and organizationally sustainable and practicing sustainable water resources management and ensuring economic benefits to members.

5.4.2 The main expected outcomes

The expected outcomes from the sub-component are:

- (i) 'Light house' WUAs providing peer-to-peer handholding and other support services to weaker WUAs; and
- (ii) WUAs who are currently guided C and D advance themselves to A and B grades.

5.4.3 Abridged Seven steps WUA Development

As the WUAs have already been formed, and are in different development stages including performance grades, most of the initial step activities are not required or some corrective actions alone are required. In case there are gaps, the key intervention from the project relates to building capacity of farmers on project principles and guidelines democratic selection of office bearers and constitution of committees and their training. Moreover, the setting up the irrigation facilities also have been completed. The main tasks relating to engineering aspects mainly include familiarization of the schemes (planned in the SDMP and as constructed) by WUA office bearers and committee members.

The critical tasks are

- (i) Assessment of existing WUA to understand stage of development, key issues and critical gaps;
- (ii) Drawing up a WUA development plan, getting approval from DPMU and its implementation;
- (iii) Management, Operation and Maintenance activity from the 7 steps process;
- (iv) Planning and supporting agriculture livelihood activities (mostly technical support), and if required basic input support for promotion of new technologies will be provided; and
- (v) Supporting WUAs-institutional, MOM related, livelihood related WUA-for performance and acquiring A or B grade-setting the preparation for forming higher level organizations

5.4.4 Component Activities

The sub-component activities include:

- (i) Engaging Support Organization (SO) with a scope of service, scaled down than sub-component (i);
- (ii) Mapping and assessment of WUA institutional performance, identifying reasons for deficiencies and options for improving performance and mitigating performance challenges;
- (iii) Preparing an organization development cum revamp plan for all different performing WUAs;
- (iv) Reorganizing, rejuvenating and building capacities of reconstituted management committee and other sub-committee members;
- (v) Providing handholding support on MOM planning, financial management and accounting crop planning and water distribution, accountability and governance practices etc.; and
- (vi) Annual grading of WUAs.

5.4.5 Light House WUAs

WUAs which have acquired diversified technical, financial and managerial skills and successfully demonstrated planning, implementation and continued maintenance of irrigation services during phase 1 of the project will also be identified and hired to provide peer-to-peer handholding and system building support to upcoming WUAs as well as differentially performing ones. The light house WUAs have sufficient skilled and experienced persons, especially former office bearers and committee members who are champions of the institutional processes and WUA model.

5.4.6 Budgetary Support for existing WUAs

The existing WUAs who require support to improve their performance will be provided peer to peer support through master trainers on institutional engineering and agricultural support systems. A

budgetary provision may be kept for well performing WUAs (A+, A&B) who organize into a cluster to facilitate activities trigger knowledge building, adoption of technologies & practices. This fund could be given to Cluster as grant from project followed by a checklist and grading. Capacity building for treating the fund as a revolving fund at WUA level will be supported.

Provision of such fund (revolving in nature to WUA) enable project to deepening activities target dissemination of knowledge and practices, through “WUA -own initiatives” instead of “100 % support from project”.

5.4.7 WUA Contribution

A provision for contribution will be created for any input support to existing WUAs from project end. The project administered the concept for tension meter and here WUA contribution was 20 %. WUA procure the instrument using corpus and after checking, remaining 80 % cost of tensiometer was released to the WUA by the project. Besides, a practice will be promoted to WUA to share a percentage of benefit to WUA-by-WUA members for corpus building. This practice has been encouraged by the past project experience and has contributed to financial sustainability and continued governance.

5.5 Sub-Component A.3: Organization Development of WUAs through Federated Arrangements

This sub-component is for supporting activities for developing inter-village (or inter-cluster level) level institutions at block/district level to consolidate and sustain irrigation investments and livelihood development results generated at scheme/cluster/village levels. Having successfully managing the irrigation service and also supporting members on livelihood activities at the scheme/village level, WUAs graduate to network among themselves and undertake activities at next higher levels.

5.5.1 Objectives

The objective of the sub-component is to support networking, clustering and aggregation of matured WUAs (A+, A, B, C and D grade) into a united or federated farmer organization at block/district level for maximizing the benefits of scale in attracting partners and enabling greater bargaining power, broad-based representation and aggregation of demand.

5.5.2 The main outcomes

The expected outcomes of the Sub-component activities are:

- (i) Federations of WUAs/Farmer Producer Companies/Farmer Livelihood Federations established and functioning;
- (ii) WUAs/farm families getting benefits of economies of scale in livelihood input provision;
- (iii) WUAs/farm families getting benefits from partnerships entered into by federation; and
- (iv) WUAs/farm families directly linked to markets, bulk procurers, processing units etc.

5.5.3 Component Activities

In addition to establishing a federated organization and getting it registered under Societies Act/ Companies Act as an LLP, the organization will be endowed with higher level skills and competencies in business development, market-based planning and entrepreneurship. The component activities are:

- (i) facilitating cluster mode in the functioning of WUAs as collective organizations;
- (ii) Technical assistance for organization development including systems and institution building;

- (iii) capacity building on management and entrepreneurship through exposure visits, trade fairs, structured learning etc.; and
- (iv) provision of information and innovative technologies.

5.5.4 Clusters of WUA

The project will undertake networking and clustering of WUAs as a strategy for higher level collective actions and graduation into secondary level organizations. The phase-I experiences indicate that clustering of WUAs with the leadership of lighthouse WUAs have achieved good results in produce aggregation, marketing, and linkages with FPCs. The project will institutionalize the experience through clustering as a first step in forming and strengthening second tier organizations of WUA. The key purpose of having cluster of WUAs are many fold. Among them a few important are:

- **A Strategy for withdrawal:** Primarily it is a part of withdrawal strategy of the project. Through cluster formation and strengthening, Project in phased manner withdraw its regular support from well performing WUAs at first and later from rest WUAs formed during phase-I of the project. Project will focus upon to provide nurturing support to cluster instead of WUAs and facilitate light house WUAs for nurturing of low performing WUAs within cluster.
 - **Capacity building of WUAs:** Through cluster potential lead farmers and light house WUAs could be mapped and mobilized to act as resource for grooming other WUAs. This trained human resource layers can bring about larger impact in changing mindset of farmers due to their local presence and field-tested expertise. Simultaneously light house WUAs can act as immersion ground for training of farmers from WUAs formed newly. Farmers to farmers learning through participation and demonstration may take place through light house WUAs.
 - **Collective procurement:** Mostly within WUAs farmers purchased seed, fertilizer, other inputs individually or sometimes a group of farmers together. In majority they depend on local seller for purchase of any inputs. In cluster setup there will be a scope for purchase bulk volume if planned accordingly. Purchase in volume will reduce cost in comparison to individual purchase and ensure quality with credit scope. Farmers would have better voices and can purchase from dealer point in wholesale price.
 - **WUA to WUA support:** WUAs are purchasing many inputs which other WUAs can produce like fingerling, sapling, Vermi compost, bio inputs, quality seed, fish feed, etc. within cluster and intra cluster interface within and outside district may help accessing this internal market comprising of WUAs as consumer as well as itself a seller. Project is procuring many inputs for demonstration of good practices. Through cluster-based approach, Project may procure such inputs from cluster of WUAs.
 - **Aggregation of produce and improved market access:** On an average a small and marginal farmers prefer to sold its produce from field. Resulting they depend on middle man and many cases sold their produces in lower prices. In contrary, if there is an effective cluster with good leadership, then farmers can plan for cultivation of produce in volume taking consideration of market, climate, etc. if produces be graded and aggregated in some places with volume that would attract higher level vender or cluster may transport the produce to higher level market player followed by cost benefit analysis.
- Besides, there are regions which are suitable for certain type of crops which has good market also. As farmers are segregated, hence, they fail to get benefits from such crop as many farmers are producing the same crop at certain period and individual farmer has less produce to access market

as organized force. In the scenario, cluster may act as catalyst to attract market with volume and can negotiate with price. Cluster leadership can act as a link between market and farmer.

- **Custom Hiring center:** Farm mechanization is becoming a cost-effective intervention for agriculture, horticulture and allied activities. Cluster in convergence and with project support and through bank linkages may set up a hub and hiring center for farm equipment. Other WUAs within and adjacent cluster can be linked and an internal market can be organized, beside external market.
- **Collective voices, visibility and protection:** WUAs within cluster can create a volume of organized human resources with vision. They Can connect other line departments, access other entitlements and services together. Togetherness may create a psychological support window during crisis as we have observed during Covid 19 pandemic situation. Mutual help could be facilitated through cluster.

5.5.4.1 Cluster Composition and Structure

Based on a micro watershed, within a radius of 3 to 4 kms and depending upon field conditions of contiguity, accessibility etc. existing WUAs are formed into a formal cluster. A cluster shall have an Executive Committee with equal representation from each constituent WUAs. For better functioning of cluster, a Planning Committee has also been formed under EC. The Executive Committee shall have a President, Secretary and a Treasurer to perform day to day administrative functions and Planning Committee shall have President and Secretary to coordinate activities of Planning Committee. Beside there may be some subcommittee as per cluster requirement, comprising members from Planning and Executive Committee and other members as fixed by the EC. Office Bearer of any WUAs will not be encouraged for representing WUA at cluster. All these Committees shall be accountable to the members through the Annual General Meeting (AGM) of the members. Planning committee will plan of whole resources and future action and that will be implemented by the executive committee.

All WUAs existing as well as new will be inducted into the cluster. When new schemes are coming up within the geographic boundary of a cluster, the user group approach to mobilize the beneficiaries of the scheme will be resorted to. If the scheme is large enough and supporting adequate number of members a new WUA will be mobilized which will ultimately incorporated in the cluster.

5.5.4.2 Roles of Clusters

The clusters will perform higher level roles to benefit WUAs as its primary members. The roles are:

- (i) Mapping of resources-human, water resources, crops, produces and other natural resources;
- (ii) Planning for and preparing proposals for institutional and economic activities to enhance incomes of farmers;
- (iii) As an intermediate platform facilitate linkages to WUAs with existing FPO/FPCs, private sector and markets;
- (iv) Nurturing low performing WUAs through light house WUAs within the cluster;
- (v) Implementing various collective actions on behalf of WUAs in the cluster;
- (vi) Act as a catalyst in the value chain development and to access market as an organized unit.

5.5.4.3 Registration

Organizationally the cluster will be a formal in setup. It can be registered under Societies Registration Act 1961 with separate bye laws. A discussion in this accord would be generated with auditor to explore the scope of enabling cluster for undertaking economic activities for its members. Draft MOA attached.

The 'cluster with higher level of performance' or 'cluster having entrepreneurship skills' to be facilitated to get registered under Companies Act so that it could act as FPC/FPO. In each district, care will be given to constitute a minimum of 2 such cluster which can act as FPO/ FPC in future. The other clusters of the district would be facilitated to act as aggregator of produces and trading of such produces may take place through district FPO/FPCs.

5.5.5 Farmer Producer Companies

As the cluster of WUAs gain enough experience in various collective actions, and need arises to have legal status, the project will consider the suitability of registering a minimum of 2 FPO/FPCs per district as per field situation in future. These organizations will be facilitated to link with Sufal Bangla (government organization) and other agencies as part of value chain development. These institutions will act as trader and other cluster of the district as aggregators. The project will support hiring of that skilled agencies for supporting value chain development. Two different agencies will be selected on a regional basis. The supporting agencies will work on value chain development and support establishing market linkages. A sum of Rs. 10 Cr (for the entire project span) may be invested for the purpose.

Institutional part support related to FPO/FPCs would be given through Institution strengthening personnel comprising IDS and SO / SP team. Separate training would be given to them as ToT mode for improved deliverables.

Indeed, as decided that project would explore the best possibilities for registration of entrepreneur cluster to FPO/FPC, involving all key stakeholders. Currently, Agriculture Department, Govt. of West Bengal is promoting FPCs. A set of NGOs with expertise have been selected by the concerned department for extending a time bound and output-based support to farmers to unite them into FPCs and value chain development. As promoted by Agriculture Department, GoWB, the WBADMI project may develop FPO/FPCs by engaging potential NGOs for handholding and nurturing and value chain development and existing SO team under DPMU, WBADMIP would support for institution building (FPO/FPC) from potential cluster of WUAs.

The key purpose of the intervention is to enable the farmers to access market unitedly and to sustain the project interventions beyond project completion. Adoption of market focused approach not only benefits farmers with higher income but also act as instrument for collective actions **for sustainability and better operation and maintenance of the minor irrigation schemes.**

5.6 Community Engagement during works

The phase-II will streamline the role of WUA during scheme design implementation and for operation and maintenance.

5.6.1 `OK' Card System

One of the methodologies for quality assurance practiced during Phase-I, is the issuance of OK card by WUAs involving farmers in the command area. This will be continued through either: (i) by a group of selected WUA members of same category of schemes which have been handed over and functioning well; or (ii) jointly by WUA members of the scheme where OK card to be administered.

5.6.2 Taking over of schemes

Commissioned schemes will be taken over by WUAs. It will follow a protocol of community event, checklist and preparation of a asset register on the date of taking over.

5.7 Working through community institutions i.e. WUA / Cluster of WUAs

5.7.1 Background:

West Bengal Accelerated Development of the Minor Irrigation Project (WBADMIP) is being implemented by the Water Resources Investigation and Development Department of the Government of West Bengal since 2012. After withdrawal of World Bank support in 2019, Project was carried out under West Bengal State Development scheme until it secured further financial support from World Bank in the name of WBADMIP Phase-II for the period from FY 2023-2024 to FY 2029-2030. The project aims to provide irrigated water to small and marginal farmers in rain-fed areas across the state through different minor irrigation (MI) structures appropriate to respective agro climatic zone. In addition to that, focused support is given to boost collectivization action through forming and strengthening of the water user associations (WUA) comprising water users from one or more MI structures for promotion of participatory irrigation management, better up keep and maintenance of the MI structures and to increase income of the farmers through judicious uses of water by adopting scientific technologies and practices related to agriculture, horticulture and fisheries. Project also facilitates WUAs toward clustering for better visibility, accessing other benefits and entitlements as well as for better market access. Till date so far 4751 Minor Irrigation (MI) sub projects (out of 5018) of different types of MI schemes with command area varying from 5 to 50 Ha have already been constructed and handed over to the WUAs totalling 2875 number, to irrigate a total command area of about 51882 ha, covering 22 districts of the state.

It is evident from earlier intervention that WUAs or Cluster of WUAs can act instrumental in the whole value chain development or in supply chain development process if properly guided and facilitated. WUAs can perform the role of resource organization, as an enterprising entity or entrepreneurs, support hub for other WUAs and an executor of various works / services on behalf the project as a valued partner.

Different kind of low skill activities like organizing training, exposure visits, construction of vermi pit, low cost nursery, poly shed, and plantation activities, raising sapling, fingerling, scampy rearing, etc. are being carried out by the WUAs. During execution/implementation of such activities in various cases women members took leadership also. Such activities enabled the WUAs to enhance their corpus in a sustainable way. Report indicates that currently out of approximately Rs.7 Cr. of accumulated corpus, contribution mostly received from WUA level entrepreneurship activities and from fisheries. Beside corpus, such activities boost motivation, confidence and enthusiasm within WUAs. Maintaining quality is another important deliverable that has also been observed during execution of such activities.

Taking into consideration the phenomenon scope for empowering WUAs by execution of activities through them instead of outsourcing it to other agency, during WBADMIP Phase- II, Project considers scaling up of execution of more activities through WUAs or cluster of WUAs in a planned way for self-reliance and sustainability of WUAs. It is further envisaged that in near future this process may open up the window for WUA to WUA transaction system into practice.

5.7.2 Objective:

Capacity building in Agri-production in cluster mode comprising producer WUAs on specific strength basis along with resource mobilization, corpus generation, entrepreneurship and social skill development. Producer cluster shall be able to supply its produce to any geographical spread.

Enable producer WUAs to become an active part of whole value chain and supply chain development process for institutional sustainability along with improved quality of life and income of farmers.

Capacity building of WUAs for execution of low skill works utilising locally available materials under the supervision of Engineers, Specialists and field staff of DPMUs & SPMU.

Capacity building of WUAs regarding activity management, logistic etc.

Promote self-sustaining robust village ecosystem for commodities like seed, saplings, fish feed, etc. through WUA-to-WUA support mechanism.

5.7.3 Approach and Methodology:

- a. DPMU/SPMU may involve WUAs/ Cluster of WUAs on nomination basis for execution of low skill works, supply of WUA/Cluster of WUAs' produce as input to other sub-projects, and rendering support services required under WBADMI Project. Annual Action Plan has to be approved before carrying out activities involving WUA/Cluster of WUAs. Annual Action Plan must also specify the activities to be implemented involving WUA/Cluster of WUAs.
- b. The rates of all such activities to be done by WUA/ Cluster of WUAs, will be fixed item wise and at lower side considering the rates of same /similar item collected from any Government department or market as per availability. Cost norm along with item wise rate for work, goods and service, excluding any agency profit, to be prepared, updated and approved by the SPMU. Labour component of the unskilled work has to be estimated in term of Man days following latest MGNREGA rate. After Administrative Approval & Financial Sanction, work order to be issued directly to the WUA / Cluster of WUAs without the need for an agreement in place for the purpose of execution. WUA/Cluster of WUAs shall carry out the work/activity, under the supervision of the respective District Project Management Unit (DPMU). Progression of all activities may be monitored through STEP.
- c. Transparency, collective participation, inclusiveness, ensuring active and meaningful participation of women, underprivileged communities, last mile farmers, etc. are the guiding principle towards execution of activities through WUAs/ Cluster of WUAs.

5.7.4 Issuance of Work Order by SPMU/ DPMU for execution of activities through WUA:

The project is in the center to facilitate execution of activities through WUAs/Cluster of WUAs. As all payments under this project is supposed to be routed through treasury department, hence awarding work order is pre requisite and non-negotiable criterion. Indeed, the types of activities to be performed by the WUAs or cluster of WUAs are as follows:

5.7.5 Nature of Activities to be performed by WUAs/Cluster of WUAs

Activities may be carried out by the WUAs/Cluster of WUAs are as tabulated below, and subject to periodic modifications.

Sl. No.	Nature of Activities	Comp-A (Strengthening Community)	Comp-B (Minor Irrigation Structure)	Comp-C		
				Comp-C1 (Agriculture)	Comp-C2 (Horticulture)	Comp-C3 (Fisheries)
1	Works	Nil	1. Construction of open pump dug well (PDW)	1. Construction of Pucca Threshing Floor by seed production WUAs 2. Construction of Azolla Pit 3. Construction of low cost vermi compost pits.	1. All labour oriented work starting from layout, digging of pits, happa of 30-40 model, small field ponds and trenches, earth & manure filling, intercropping, watering, fencing, pre & post watering and nurturing of plants for plantation work 2. Construction of low cost vermin compost pits. 3. Construction of low cost poly shed /shed-net nursery 4. Construction of Neem Cake production unit	1. Hatchery civil works 2. Civil works of small scale Fish Feed Plant

Sl. No.	Nature of Activities	Comp-A Strengthening Community	Comp-B Minor Irrigation Structure	Comp-C		
				Comp-C1 Agriculture	Comp-C2 Horticulture	Comp-C3 Fisheries
2	Goods (WUAs' own produce)			1. Bio inputs 2. Different types of seed	1. Bio inputs 2. Vermi compost 2. Saplings for orchard plantation, intercropping and floriculture 3. Neem cake/oil 4. Mulching materials 5. IPM kits 6. DFL for Tasar cultivation 6. Earth worm	1. Fingerlings, spawn & fish feed 2. Scampi PL, Juvenile, Brooder

3	Services to be rendered by WUAs	1. Event management in different types of training/exposer-visit organised up to village/block level.	1. Event management in different types of training/exposer-visit organised up to village/block level.	1. Event management in different types of training/exposer-visit organised up to village/block level.	1. Event management in different types of training/exposer-visit organised up to village/block level.	1. Event management in different types of training/exposer-visit organised up to village/block level.

5.7.6 Works to be executed by WUAs under Component 'B' & 'C'.

WUA eligibility criteria to receive work order. A registered WUA having Bank Account and PAN card.

Limitation of application:

- i. The works may be executed by the eligible WUAs by themselves, as the execution of works requires low technical knowledge and skill. In case of any small civil construction work like dug well, Pucca Threshing Floor etc., WUA may engage mason locally and may execute the work under the guidance and supervision of DPMU. Work order to WUA would be issued by the Executive Engineer of DPMU **directly on nomination basis** after obtaining STEP clearance, Administrative Approval & Financial Sanction.
- ii. Maximum limit of Work Order for any single work may be limited to Rs.2.5 lakh.

Procedure to be followed

- a. During preparation of DPR of any scheme at any WUA, DPMU may approach the respective WUA to know their willingness to execute the scheme on their own.
- b. Willing WUA will submit a request in specified format (Annexure 1: format for request) along with resolution depicting their willingness to undertake the activities as per approved DPR/design/estimate.
- c. The said activities may be undertaken in their own land or common land taken on lease for min 15 years. In case of land taken on lease, it should be at least registered by Notary.
- d. DPMU will scrutinize the application on the basis of a checklist (Annexure-2) and if found satisfactory then prepare & submit DPR to the SPMU for technical approval. While preparing DPR, agency profit to be excluded and cost norm to be followed diligently. For any scheduled item of works, 10 % cost may be deducted from each item rate, as agency profit, while preparation of estimates for the works.
- e. After technical approval, STEP clearance has to be obtained by the respective DPMU. Thereafter SPMU will issue administrative approval and financial sanction. Finally, Work Order, single or multiple, will be issued directly to WUA by DPMU.
- f. WUA will execute the work and once work is completed, WUA will hold a meeting and resolve for completion of work with request for payment.
- g. DPMU will visit and measure the activities and prepare the bill.

- h. DPMU will make payment to WUA against the work done as per measurement.

Supervision and support

- a. Works shall be carried out under the active supervision of DPMU Office. Each milestone of the activity to be recorded by the DPMU Personnel at in the Activity Register to be maintained at WUA.
- a. Geo Tag Photo/ Video Clipping
- b. WUA Resolution with record the event / activity and expenditure in details

Documentation and Book Keeping

WUA should maintain all execution related documents like resolutions in different stages, updated cash book, stock register, asset register, all bills and vouchers etc. for future audit and to maintain transparency.

5.7.7 Goods to be supplied by WUA as their own produce for Component-‘C’

WUA eligibility for receiving Work order

- a. A registered WUA having bank Account and PAN card.
- b. WUA/Cluster of WUA must produce the goods of supply following SOP under supervision of DPMU and SO expert. Producer WUA/Cluster of WUA can supply their produce to any other WUA as input to their scheme activities.
- c. WUA must be a well performing WUA with grading score “B” at least, and has considerable corpus fund.

Limitation of Supply order:

There is no such financial limitation against issuing of work order for goods to be supplied by WUA as their own produce on consideration that-

- I. Items to be supplied related to Agriculture, Horticulture and Fisheries falls under exemption category of GST.
- II. Any WUA who may produce the required quantity following all norms and guidelines as detailed in respective SOP can eligible to supply the whole, whatever the value of work it may be.

Work Order to WUA to be issued by the Executive Engineer of DPMU **directly on single selection basis** after obtaining STEP clearance, Administrative Approval & Financial Sanction.

Procedure to be followed

- a. DPMU will identify potential WUA / Cluster of WUAs according to key produces that the WUA / Cluster of WUAs may produce strictly following the SOP / guidelines provided by the SPMU. DPMU will also estimate item wise tentative marketable surplus quantity and period of availability, of each producer WUA/ Cluster of WUAs willing to supply at approved rate to any WUA inside or outside the district. SPMU will summarize the data and upload in MIS for planning.

- b. During preparation of DPR of any scheme at any WUA, DPMU may approach producer WUA/ Cluster of WUAs under WBADPI Project to know their willingness to supply their produce required as input of the scheme for which DPR is prepared.
- c. Willing producer WUA/Cluster of WUAs will submit a request in specified format (Annexure 1: format for request) along with resolution depicting their willingness to undertake the supply works activities at approved rate, and as per specifications.
- d. DPMU will scrutinize the application on the basis of a checklist (Annexure-3) and if found satisfactory then prepare & submit DPR to the SPMU for technical approval. While preparing DPR, agency profit to be excluded and cost norm to be followed diligently.
- e. After technical approval, STEP clearance has to be obtained by the respective DPMU. Thereafter SPMU will issue administrative approval and financial sanction. Finally, Work Order, single or multiple, will be issued directly to WUA by DPMU.
- f. After completion of delivery of commodity as per work order, supplier WUA / Cluster of WUAs will raise bill and submit it to the respective DPMU with other documents like, challan, resolution, photo for necessary payment. DPMU will visit and measure the activities and prepare the bill and make payment to supplier WUA against the supply work done as per quantity and specifications.

Supervision and support

- a. Supply works shall be carried out under the active supervision of DPMU Office. Each milestone of activity to be recorded by the DPMU Personnel in the Activity Register to be maintained at both Supplier WUA/ Cluster of WUAs and receiving WUA.
- b. Geo Tag Photo/ Video Clipping
- c. WUA Resolution with record the event / activity and expenditure in details

Documentation and Book Keeping

Producer WUA should maintain all operational records and documents for being the eligible WUA as per SOP of the respective goods. In addition to that producer WUA should maintain documents like resolutions in different stages, updated cash book, stock register, asset register, all bills and vouchers etc. for future audit and to maintain transparency.

5.7.8 Services to be rendered by WUAs

WUA eligibility criteria to receive world order

A registered WUA having bank Account and PAN card

Limitation of application

- a. There are no such financial limitations for organizing events like training, workshop, exposure visit through WUAs.
- b. Payment will be made on reimbursement basis as the expenditure will be allowed as per approved cost norm of each and individual items.
- c. No STEP clearance is required for organizing such events through WUAs.

Procedure to be followed

- a. SPMU will prepare and update cost norm and item wise rate per person basis for training, workshop, exposure visit etc, to be organized by the WUA. In case of any special event, separate rate chart to be approved from the SPMU as and when required basis.
- b. DPMU will prepare an Annual Training Calendar for component A and C for each year and submit it to SPMU for approval of such plan.
- c. After obtaining approval from SPMU along with AA & FS, DPMU may issue work order at approved rate to the concern WUA directly for arranging logistic support for the training programme, workshop exposure visit etc. Logistic support may entail fooding, lodging, training material, arrangement of vehicle, payment to transportation cost for resource person and participants, honorarium for resource person etc.
- d. Training may be conducted by the Resource Person, SO Expert, DPMU & SPMU Specialists. Exposure visit may take place at Light house WUA, other institution, research station, etc.
- e. Service rendering WUA should keep all necessary documents like meeting resolution before taking up the work, attendance sheet, photograph of training with latitude longitude & video clips for billing purposes. Once the event is completed, WUA will conduct closer meeting and resolve about successful completion of event along with the item wise expenses incurred.
- f. WUA will raised the invoice according to the items mentioned in the work order which are being executed and submit it to DPMU along with copy of resolutions, copy of work order, brief event report, vouchers, photo with latitude longitude and attendance sheet for necessary payment.
- g. DPMU will review all the submitted documents and if found satisfactory in all respect, DPMU will release the bill in favour of the organizer WUA.

Supervision and support

During organizing such event, at least one representative from SPMU / DPMU / SO team should present and facilitate the program.

Documentation and Book Keeping

- a. Resolution
- b. Attendance Sheet
- c. Geo tagged Photo / video clipping

5.7.9 Annexures

Annexure 1 : Format for request of WUAs showing their willingness to undertake the activities of Works/Goods/Service on their own at approved rate and specification

Annexure 2 : Checklist on the basis of which DPMU will scrutinized the application and give clearance for Works.

Annexure 3 : Checklist on the basis of which DPMU will scrutinized the application and give clearance for Supply from Producer WUA/Cluster of WUAs

Annexure 4 : Checklist on the basis of which producer WUA will monitor the activity and the produce finally get the certification from SPMU/DPMU for supply (surplus quantity) to another WUA within /outside the district.

5.8 Governance and Accountability Issues

Effective governance and accountability are crucial for the success of WUAs:

- **Transparency:** WUAs should be transparent about their activities, decision-making processes, and financial transactions. WUA will hold general meeting with all members a minimum twice in a year and disclose all financial issues to all. Members should have access to information on how water resources are being managed and distributed. Any major decision would be taken collectively and to be recorded. While distribution of any benefits to selected members, taking up entrepreneur activities, procurement related issues, holding training, etc. decision will be taken through general body meeting at first. Managing committee will execute the decision and report to general body in next meeting. WUA would encourage to reduce the number of passive members and focus will be on fixing date time and day for monthly meeting and discuss financial issues in all meetings.
- **Representation:** WUA should be inclusive. Women members should be part of Managing committee and a minimum of one woman preferably ST/ SC should be office bearer. If any WUA has members from ST and SC community, then that must be reflected in the composition of Managing committee structure.
- **Membership criteria:** Membership, should be based on the principles of equity and non-discrimination regardless of their socio-economic status, gender, or other factors.
- **Participation:** WUAs should encourage active participation of members in all activities and decision-making. This can be done through grounding PRA, regular meetings, consultations, and feedback mechanisms. Crop planning and adherence analysis in each crop seasons needed to be done with majority farmers. Grading tools have to be grounded as a collective self-assessment tool. WUA level meeting should include sharing of best practices, experience sharing, discussion on market-based information, etc. WUA should plan to cover all members with some benefits beside water through training, exposure, etc. Collective actions based on WUA maturity should include procurement of seed, fertilizer jointly, startup entrepreneur activities, construction of meeting hall with farm equipment storage unit, etc. Besides, economic activities for improved participation of members WUA should include other social and entertainment activities like observation of important days, picnic during AGM, social respond, etc.
- **Equity:** The WUA should ensure that water resources and other benefits be distributed equitably among its members including tail end farmers. The principle of equitable access to resources and benefits should be the guiding force for WUA functioning. In case of promotion of any scientific technologies and practices with high cost to selected farmers, the WUA should keep some provision of maintaining equity like sharing of saplings to all, benefit sharing for WUA corpus, etc. But for better functioning of WUA as a whole, all members should have a feel of equity and trust over WUA in respect of sharing or accessing benefits.
- **Conflict resolution:** WUAs should have mechanisms in place to address conflicts that may arise among members over water resources and other issues. This can include mediation, arbitration, dialogue, or other dispute resolution processes.
- **Complaints and dispute resolution:** The WUA should have clear procedures for handling complaints and resolving disputes. Complaints of individual or group should be discussed in general meeting and any decision taken by the majority to resolve the crisis should be recorded in minutes.
- **Financial management:** WUAs should maintain all expenses through cash book, keep all records, voucher, bills, etc. Update bank pass book periodically. During half yearly general body meet, Managing Committee will present income -expenditure statement to all and that will be recorded in minutes book. All members present in the meeting must sign the minutes.

In Phase-II many WUAs may perform as project execution agencies, hence, all financial records should be maintained professionally. WUA must undertake annual audit and report should be shared to all members. WUA should keep asset register, master roll for payment for labour charges, separate files to keep bills and vouchers, etc. Any major financial decision should be approved in the general body meeting with minimum 60-65 % members presence.

- **Accountability:** WUAs should be accountable to their members and to the broader community. This can be done through Proactive disclosure, sharing of WUA functioning, information, etc. to all. WUA should provide space to raise voices by any members and take action to resolve challenges.
- **Legal framework:** As WUAs are a registered body under Societies Registration Act 1961, hence all WUA members should be oriented on bye-laws and role and responsibilities of members as well as office bearers.
- **Clear rules and regulations:** The WUA should establish clear rules and regulations for the use of water resources, membership, elections, and decision-making processes. These rules should be made available to all members, and their enforcement should be consistent and fair.
- **Monitoring and evaluation:** WUAs should ground self-grading tools for monitoring and evaluating their performance, including regular reporting on key indicators such as water availability, distribution, and quality. This can help identify areas for improvement and ensure that the WUA is meeting the needs of its members.
- **Community engagement:** WUAs should engage with the broader community to build support for their activities and promote awareness of the importance of water management. This can include outreach programs, education initiatives, and partnerships with local organizations, SHGs, etc.
- **Sustainability:** The WUA should aim to manage water resources in a sustainable manner, taking into account the long-term needs of the community and the environment and for sustainability of WUA itself. For surface-based schemes water budgeting followed by season wise water availability calculation needs to be promoted. WUA should focus on adopting integrated approach including agriculture, horticulture and fisheries and in convergence animal husbandry and any other allied activities found rational and attainable. In addition to that WUA should have a set plan for financial security.

5.8.1 Transparency in the functioning of WUA

Transparency is an essential element of good governance in a water user association (WUA) as it promotes trust, openness, and accountability. The WUA should operate in a transparent manner to ensure that its members and other stakeholders have access to information about its decision-making processes, finances, and other important matters. Here are some ways to promote transparency in the functioning of the WUA

- **Communication:** The WUA must hold periodic meeting with all members for sharing of information, feedback and decisions. Communication within WUA includes both physical and financial issues. Important decisions should be recorded for future reference. WUA should set fix date, time, and day for monthly meeting and that must be communicated to all members well in advance. Pro-active disclosure, wall writing, etc. should be used for broad public awareness and transparency.
- **Information sharing:** The WUA should ensure that its members have access to all relevant information regarding its decision-making processes, finances, and other important matters.
- **Participatory decision-making:** Decision making process should be inclusive and owned by all benefitting members. WUA should keep an environment of openness and raising voices for all. It could be grounded while WUA making decisions through collective meeting, etc.
- **Fair and consistent enforcement:** The WUA should ensure that its rules and regulations are enforced fairly and consistently. This promotes trust and accountability by demonstrating that the WUA is committed to upholding its own standards.
- **Independent audits:** The WUA should regularly undergo independent audits to ensure that its financial management practices are transparent, accountable, and in line with legal requirements.
- **Grievance Redress Mechanisms:** The WUA should establish clear and accessible grievance mechanisms for members to raise concerns about its activities. This ensures that members have an

avenue to voice their concerns and that the WUA can address any issues in a timely and effective manner.

- **Benefit sharing:** It is a key principle for promoting sustainable and equitable management of water resources, and can provide a range of benefits for stakeholders, including increased efficiency, sustainability, and cooperation. All members within WUA should have a feel of getting equal importance in the perspective of accessing support and benefits.
- **Training & Capacity building:** training and capacity building can play an important role in promoting transparency within a WUA. By enhancing skills and knowledge, promoting a culture of transparency, ensuring accountability, and encouraging participation and feedback, training and capacity building can help to build trust and promote effective and sustainable management of water resources.

5.8.2 Social Auditing

Cluster of WUAs or WUA meet at Block or district level may be encouraged for sharing of good practices, WUA to WUA learning and adoption of good practices. Besides, WUAs may be encouraged to visit similar nature of WUAs as exposure and cross -learning. While organizing such type of meets, DPMU and SO team may facilitate to encourage visiting WUA to look after the institutional as well as other ASS aspects of WUAs visited. Both the visiting and visited WUA members may jointly discuss their observation, learning, etc. SO team participate in the visit will record and submit a report to SPMU through DPMU.

5.8.3 Benefit tracking

Water user associations (WUAs) can provide both tangible and intangible benefits to their members and the broader community. Tangible benefits are those that can be easily measured or quantified, while intangible benefits are those that are more difficult to measure or quantify.

Tangible benefits may be like Access to reliable and sustainable water supply for irrigation. Improved crop yields and higher agricultural productivity. Reduction in water-related conflicts among users. Reduced costs of water management through collective action and economies of scale, etc. while intangible benefits are like Increased social cohesion and community engagement through participation in WUA activities. Enhanced sense of ownership and responsibility among WUA members. Increased knowledge and skills related to water management and agricultural practices. Improved gender equity and empowerment through greater participation of women in WUA activities. Increased trust and transparency in water management decision-making processes.

A MIS system or app-based system may be developed for tracking such information through a structured format. Community workers may be trained for using app. These app-based information may be collected while CWs are visiting and holding meeting with WUAs. For tangible benefits through app the CW may fill the basic information like season wise crop planning and adherence, adoption of practices (year wise), no of farmers taking water in each season, water charges paid, crop wise yield etc. For capturing non tangible benefits some indicators may be developed like no of women, ST member in managing committee, changes in leadership, social respond, WUA centric economic activities, no of meeting held and average attendance and CW observation (1-5 scale) about WUA on parameters like bonding, confidence, cohesiveness, etc.

5.9 Support Organization

The social mobilization, WUA development and facilitation of livelihood activities will be outsourced to Support Organizations (SO)/Service Providers (SP). The support services provided by SO/SP during Phase I have been continued with state funds, ever since the World Bank's support finished.

5.9.1 Main Challenges from Phase-I

NGOs hired as SO/SP have played a pivotal role in mobilization of community, to unite farmers into a community-based institution i.e., Water Users Association (WUA) and to build their capacities. In the entire period, engagement of SO/SP has gone through several restructuring process based on field requirements. Initial engagement was honorarium based with fixed overhead and transportation cost to SO staff and it was observed that NGO personnel being deployed to project could not get actual honorarium or transportation as project has limited control over NGOs. The main challenges were:

- (i) **Limited mobility of SO personnel.** There was restricted field mobility SO personnel as their movement was linked to movement of the vehicles under DPMU offices though transportation cost is paid to the SOs. As a result, outputs from the SO personnel were limited and ultimately functioning of DPMUs/SPMU/WBADMIP were affected to a large extent;
- (ii) **Differential and low honorarium payment.** The honorarium paid as per contract with SOs are not benefiting the SO personnel as they were less paid by the SO and it was also noticed that same ranked SO personnel were getting different remuneration;
- (iii) **Fixed Payment acted as no incentives for productivity.** It was found that fixed payment failed to sufficiently incentivize productivity and outcomes until monitored closely;
- (iv) **Turnover of Staff.** Failing to achieve targets within the allowed time NGO payments were cut which resulted in less payment to staff and many staff members left;
- (v) **Changes in Project Approach.** The project changed its strategy of working within micro-watershed-based approach. The project could not take up potential schemes outside micro-watershed with the existing contracts and payment could not be released as entire contract with SO/SP is on micro-watershed based.

The project has evolved a description of service and ToR for engaging Support Organizations/ Service Providers in project implementation which is given Attachment 5.1. The SOs are non-governmental organizations hired for assisting DPMUs, with clear roles of mobilizing farming community into WUAs, build skills and capacities of members and office bearers of WUAs and organization development of WUAs as sustainable inclusive and transparent organizations. The SOs have to work in close collaboration and guidance of DPMU.

5.9.2 Objectives of SO Services

The SO services are hired:

- (i) To supplement outreach actions of DPMU in social, agriculture and allied sector through participatory approach;
- (ii) To mobilize and facilitate beneficiary farmers to form and organizationally develop WUAs as inclusive, accountable and sustainable organizations; and
- (iii) To build capacities and handhold farmers, office bearers and committee members, on participatory planning, community implementation and social monitoring of WUA's mandated activities;
- (iv) To enable old WUAs to federate as a cluster primarily and later FPO/FPCs in accordance with project exist strategy.

5.9.3 Scope of Work:

The services of SO are hired as part of the implementation arrangement for the sub-component (i)- Mobilization and Development of Farmer Institutions for new schemes and (ii) -Development and strengthening of Farmer Institutions for existing schemes. Under sub-component (i), the SO will be responsible for new WUAs. Under sub-component (ii), the SO will provide specialized support to existing WUAs formed under the phase I of the project and WUAs and non-project WUAs formed by the department. In addition to that SO will provide handholding and support for formation and

strengthening of cluster of WUAs including registration. Entrepreneur Cluster of WUAs to be registered (as FPO/FPC) under either Cooperative Act or Companies Act and rest clusters would be registered under Societies Act. SO would provide institution building support to all types of clusters of WUAs including entrepreneur clusters (FPO/FPC).

5.9.4 Engagement of SO

To resolve the crisis a new model has been evolved in consultation with stakeholders that is to some extent a combination of output and honorarium mode. Here, four set of payments have been conceptualised as under-

First one is various incentives against performance which has been divided among SO/ SP personnel and Organization in 60:40 ratio. This provision may be considered based on field situation and budget provisions. Second one is honorarium to SO personnel with a check that less performance may fetch less payment of honorarium and concerned Executive Engineer is sole authority to certify the deliverables against personnel, through a structured monitoring framework.

Third one, the Supervision cost for organization (SO) is fixed and based on honorarium at a certain (15%+/-5%) percentage. Fourth one is reimbursement cost which includes transportation, social security, etc. is based on the fixed rate or as per actual expenses. The concerned SO would claim to the Project after payment is done to their personnel.

Besides the above some controls have been placed in the contract that-

1. A clear provision is created in the contract that any less payment to personnel deployed by the SO/ SP to this project would be treated as performance indicators and may lead to closure of contract.
2. The requirement of skilled personnel and community workers would be up to the satisfaction of the DPMU. And provision created for change (new addition or replacement etc) of SO personnel as per field requirement based on the approval of the DPMU/SPMU.
3. It is also defined that no tolerance to any actions that conflicts with values, ethics of the project as well as the organization and for immediate report of such incidence to DPMU and SPMU for better transparency and ethical community engagement.

For monitoring and supervision of SO/ SP performance the signing of the contract is decentralised. The concerned Executive Engineer of the DPMU has been entrusted the power to sign the contract with SO/ SP on behalf of the Project Director followed by their (SO's) selection at state level. Besides some monitoring framework is developed also and shared with district. The key monitoring tools includes quantifiable indicators for each stage activities to measure the outputs. Besides, a quarterly self-assessment format has been designed and that would be rooted through concerned Executive Engineer. Alongside in the contract provision is created for monthly meeting with SO / SP and time to time written communication with SO/ SP. Apart from that a separate format is used to assess quality of works of SO/ SP through concerned Executive Engineer. This findings and field observations of different experts and officials from SPMU is considered before renewal of the contract. **Sample TOR** for the contract agreement with SO/SP is attached below as **Appendix-A** which may be improved time to time to cope with the emerging situation.

While designing of the phase -II SO /SP arrangement, taken into consideration the above noted issues, the following actions may be grounded: The SOs/SPs are engaged district-wise to bring in local knowledge and expertise. DPMUs are the contracting agencies responsible for engaging SO/SP and therefore manage the contract including monitoring and quality assurance of the services provided.

- **Duration of Engagement:** The SOs/SPs are to be engaged on an annual rolling contract. The total duration of the contract will be: (i) for new WUAs, the total duration of engagement will be 36 months and (ii) for existing WUAs the duration will be 24 months, 3 for extending support for deepening exit policy for all WUAs (new and old) duration of engagement will be for another 12 months (if necessary).

- **Activities and Deliverables:** The main activities to be carried out by the SO and critical deliverables to be achieved are in Table-5.5.

Table 5.5: SO Activities and Deliverables

Project Cycle Stage	Main Activities	Timeline	Key Tasks	Main Deliverables
Pre -Planning	Sensitization and Awareness Building	4 months	Campaigning on sustainable Water Resources Management	All village level stakeholders on board and willing to collaborate with project. Mass petition expressing farmer willingness to participate. MI schemes approved
			Awareness raising on project principles and objectives	
			Buying in willingness to participate in the project	
			Identification of scheme type and locations	
			Identification of entry point activities	
Planning	Mobilization and formation of WUA	4 months	Enlisting potential farmer beneficiaries (including fishery, animal husbandry, etc.)	WUA registered with an adopted byelaw 80% of the potential beneficiaries join the WUA FIG or other sub groups formed. Bank A/C opened; PAN card done. Women representation in MC ensured
			Mobilizing and training beneficiaries to work together	
			Training on WUA structure, duties and responsibilities	
			Facilitating adoption of byelaws	
			Facilitating selection of leaders and constitution of committees	
			Training office bearers and committee members	
			Handholding mobilization of membership in WUA and grounding PRA	
Planning	Participatory planning for Irrigation Services	4 months	Training MC and SC members on participatory SDMP preparation	Socio-economic and background information realistically collected and incorporated into SDMP MC and SC members fully conversant with SDMP
			Collecting data using PRA tools	
			Discussing and deciding on scheme type, technology options with farmers	
			Receiving farmers feedback on engineering designs	
			Discussing and approving SDMP finalized by DPMU by GB	
Implementation	Participatory Implementation of MI Schemes	12 months	Training MC and SC on implementation supervision	The MI schemes as planned has been constructed/installed MC and SC members confident to take over
			Farmer monitoring of works and installations	
			Completing Okay cards	

				management of MI scheme
Post Implementation	Management Operation and Maintenance	12 months	Training on MoM (including solar)	The MI assets are taken over, irrigation services delivered as per the approved schedules and water charges are collected as fixed by GB
			Deciding on operations arrangement	
			Providing irrigation services as per the approved water budgeting & distribution plan	
			Collecting water charges as per rates approved by GB	
			Maintaining books of accounts	
			Following up arrears in collection of water charges.	Equitable and sustainable water resource utilization & management
Post Implementation	Planning and Supporting agriculture Livelihood Activities	36 months in parallel to MoM	Facilitating and linking with extension and input supplies	Realization of incomes in the hands of member farmers through efficient utilization of irrigation services
			Facilitating preparation of crop plans/fisheries activities for individual farmers in groups	
			Facilitating extension activities including demonstrations through FFS, FFD, etc.	
			Facilitating supply of seeds, fertilizer, and other inputs	Crop specific cost benefit analysis and accordingly crop planning
			Facilitating Organic based intervention	
			Facilitating Crop Diversification and promotion of oil seeds, pulses, etc. intervention	Adoption and replication of good practices – tracking & recording
			Converging services to farmers from private sector and other agencies including marketing support	
Post Implementation	Preparing to Graduate to Second Level Organization Structure	12 months after MoM	Grading of WUAs on an annual basis.	Significant majority of WUAs are rated A or B grade
			Identifying 'light house' WUAs tagging them with WUAs requiring additional handholding.	
			Other support to WUAs in the lower grades to improve their functioning and grading.	
Post Implementation	Federated WUAs into cluster and later FPO/FPC	12 months after planning and supporting	Mapping of cluster and SHGs within cluster	WUAs federated and WUA to WUA support started
			CB of light house WUA, lead farmers and facilitate peer learning environment creation	
			Cluster Registration and CB on role responsibilities of committee, office bearer, etc.	Entrepreneur WUAs start functioning as FPO/FPC
			Cluster wise development plan – institutional, produce based program and marketing, etc.	
			Value chain development support under the guidance of expert team and linking cluster.	Cluster wise value chain development analysis planning and execution.
			Follow ups for adoption and replication.	

The main objectives of engaging SOs are:

- To facilitate sensitization awareness building and mobilization of farmers into WUAs;
- To facilitate farmer participatory
- To carry out training and other capacity building of farmers and their leaders-MC members, SC members-on sustainable water resources use, planning, implementation, management and operation of irrigation services, governance and accountability aspects, livelihood development activities etc.;
- To handhold MCs, SCs and office bearers for the smooth conduct of their roles and responsibilities; and
- To facilitate farmer participatory data and local information gathering for planning MI services (socio-economic data through PRA and other participatory methodologies)
- To facilitate WUAs to federate as cluster/FPO/FPC

The key roles of the outsourced support organizations are:

- (i) Sensitizing farmers in the command area of proposed schemes on the project; and
- (ii) Building awareness on water resources sustainability and options of irrigation services; and
- (iii) Training and handholding on agriculture support services including institutional strengthening; and
- (iv) Enabling old WUA to federate into Cluster / FPO/ FPC for mainstreaming and sustainability.

In social mobilization, SO will focus on formation of WUAs and its structural entities, their development and training, handholding for the planning and effectively render organizational support and facilitation services. The support organizations will deliver participatorily developed Scheme Development and Management Plans (SDMP); setting up a performing irrigation service fee collection, recording and accounting system for the WUAs; an equitable and sustainable water sharing and utilization system; and WUAs graded A or B depending upon the governance procedures, social accountability mechanisms and sustainable systems in place for water resources management. The WUAs will be supported to function as equitable and accountable organizations focusing on gender issues, inclusion of poor and most vulnerable farmers and transparent decision making and fiduciary practices. Under agriculture support services, the SO is primarily responsible for extending outreach support including capacity building and monitoring. These activities target to bring about a positive change among farmers towards adoption of scientific technologies and practices on agriculture and allied sector for better income. Formation of cluster of WUAs is another key action trigger mainstreaming and gradual withdrawal from project support. SOs will be responsible for forming and strengthening of clusters and facilitate nurturing of WUAs through light house WUAs within cluster. The entrepreneur cluster of WUAs will be facilitated further to act as FPO/FPC. It is expected that these FPO/FPCs would contribute in value chain development. SO with the support of market skilled agencies will facilitate the whole process.

The key outcome from the sub-component are self-sustaining WUAs delivering irrigation and water management services to farmers. Besides, quality of life of the farmers have been improved significantly due to better income, enhanced knowledge and practices on agriculture and allied sector along with better market access for selling of produces.

5.10 Project Exit Strategy

MIS analysis and field observation reveals that from Batch -I to Batch -VI WUAs have already received project support for a longer period and it is expected that an ecosystem within WUA has already been

developed. It is discussed that project would withdraw its support from Batch -I to VI WUAs who are performing good (scored A+ to B). and every year batch wise withdrawal would take place.

A focused support for 12 months would be given to WUAs score C&D from withdrawal batches followed by a SWOT analysis and therefore, they would be helped to get included in existing cluster as part of withdrawal strategy.

WUAs after withdrawal would be given periodic monitoring support only. In-depth support would be considered if new technologies and practices be introduced. Otherwise support to WUA would be grounded through cluster and nature of support would be technical. No such budgetary allocation would be there for WUAs falling under withdrawal category.

WUAs selected for withdrawal would be facilitated to be included within the cluster. Project would focus on strengthening the cluster with the active participation of well performing WUAs. In other word withdrawal strategy signifies the strategy of mainstreaming WUAs through cluster-based approach. Here, poor performing old WUAs can be supported by the mature WUAs. Cluster will be supported from project to cater advance challenges like market, trading, collective procurement, etc.

The exit strategy is based on the adoption of cluster mode approach. Cluster would act as an intermediary between WUA and FPO/FPC. Here, WUA would be strengthened primarily by the project and therefore be linked with existing or newly formed cluster of WUAs as per mutual suitability and access. The process would help optimise the use of DPMU, SO and SPMU resources and able to capitalise resources and capacities of well performing WUAs for nurturing other WUAs. Collective action through cluster would generate volume of produces as well as internal organized market for consumption of produces. In addition to that some entrepreneur cluster within each district may facilitate further to act as FPO/FPC who in turn can act as trader and other cluster as aggregator. This process may help in value chain. Apart from that building capacities and adoption of good practices & technologies on ASS are another important area that may take place within cluster set up in a cost-effective way. Cluster will generate corpus as well WUAs. Availability of fund both at WUA and Cluster of WUA would enable cluster for taking greater risk and challenges. Through WUA based cluster and FPO/FPC model may ensure sustainability in future due to the reasons for adoption of bottom-up approach and shared collectiveness which ensure better trust and leadership for future.

6. COMPONENT-B: IRRIGATION SYSTEM DEVELOPMENT

The component will improve accessibility of water for agriculture, horticulture, and fisheries related livelihoods of farmers. The focus will be to develop rainwater harvesting (storage) structures in watersheds that are predominantly water resource constrained and currently cultivated under rainfed conditions. The aim will be to scale up the segmented approach innovated during phase 1 which helped to target interventions that most suited to diverse landscape of the state: drought prone red lateritic region, coastal and hilly terrain.

6.1 Experience from Phase-I

The project delivered MI schemes with a balanced distribution across the districts refocusing rainfed areas. The implementation of the hardware component brought about transformations in the areas of:

- (i) segmenting project areas based on potential diversities and current status of irrigation for focusing project interventions;
- (ii) systematizing site selection for schemes by identifying geographic areas delineated as polygons;
- (iii) clustering of schemes;
- (iv) customizing scheme designs using modern equipment;
- (v) dynamizing preparation of SDMP in place of conventional DPRs for proposal preparation through participatory involvement of farmers; and
- (vi) following a web-based monitoring system consisting of remote sensing imageries and GIS-based visual information.

In terms of scheme types the project achieved adaptations to match diversity of farming practices and agro climatic zones. Three main scheme types which prominently evolved were check dams, creeks and Hapas which were not there originally. Even in traditional scheme types like tube wells, PDW and check dam various innovative practices were evolved including design and use of digital technologies for investigation etc. The main highlight of MI schemes installed by the project included water harvesting structures like ponds, check dams and excavated creeks. The innovative practices brought in substantial visible improvements both in construction and performance. The project introduced solar panels to energize pumps which brought in substantial benefits including reduction in carbon footprint.

Remote sensing-based GIS and spatial MIS helped the project identify focus areas for project intervention, selecting project locations based on water resource availability and feasibility, physical designing of schemes, digitizing SDMP preparation and use, monitoring scheme structures and scheme progress and impact assessment. The home-grown integrated web-based GIS and MIS facilitated decision making through evidence-based approaches. The technology driven reforms helped automation as well as improvements in quality, reliability and sustainability of schemes.

6.2 Objectives of the Sub-Component

The objective is to enhance agro based livelihoods of small and marginal farmers consisting of agriculture, horticulture, agro forestry and fisheries through augmenting water resources with the construction of minor irrigation structures.

6.3 State level Planning

6.3.1 Agro climatic Divisions of the State

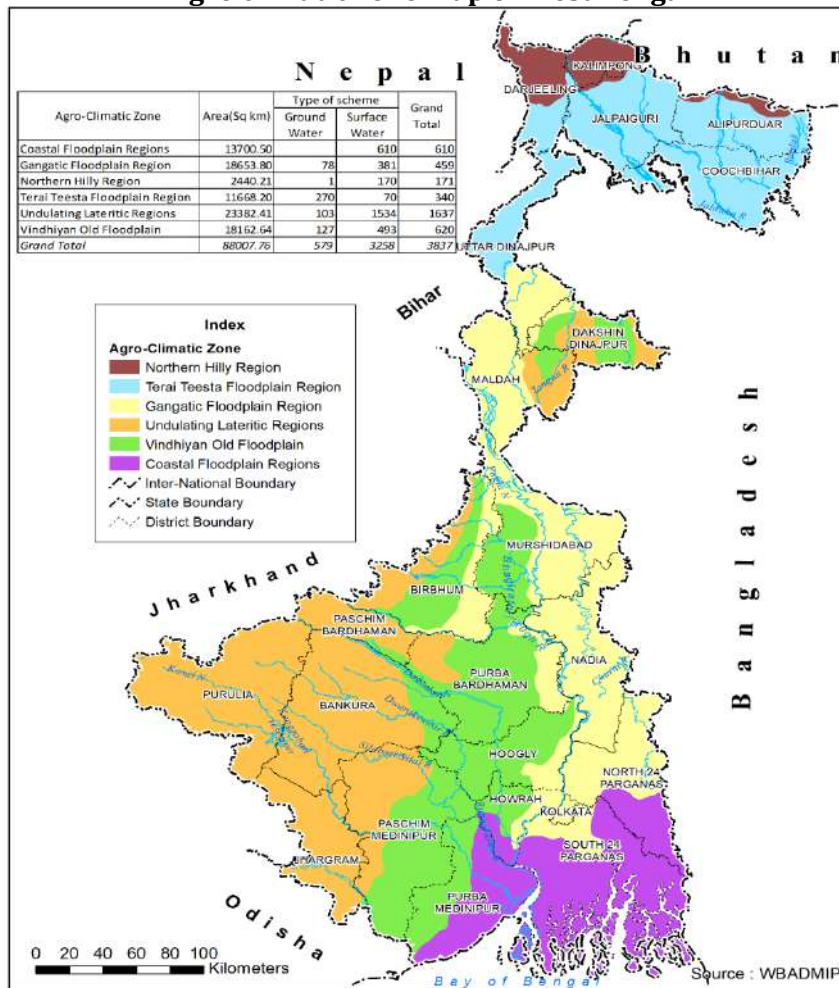
Based on topography, physiography and geology the state is classified into 6 major regions

- These are Coastal flood region (21 %)

- Gangetic Flood Plain (21.5%)
- Northern Hilly region (2.5%)
- Tarai Teesta Flood Plain (13%)
- Undulating Lateritic zone (24 %) and
- Vindhyan Old alluvial (18%).

The agro climatic zone map of the state is given in Figure 6.1.

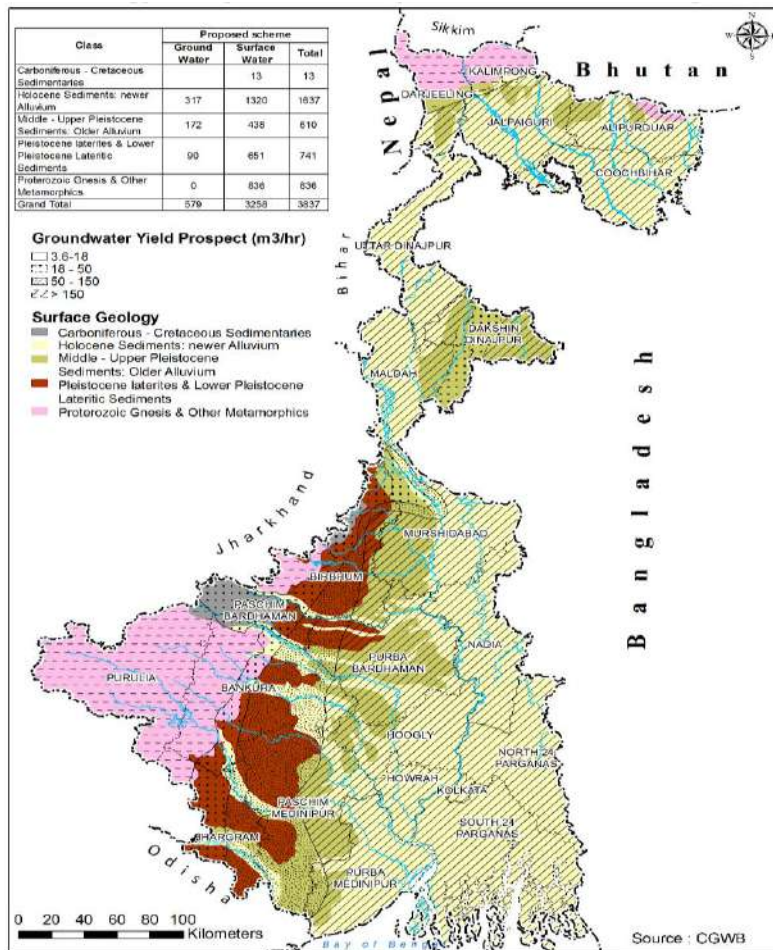
Figure 6.1
Agro climatic zone map of West Bengal



6.3.2 Geology and ground water availability of the state

The geological formation of the state is classified into five classes as shown in figure 6.2

Figure 6.2
Geology and ground water yield zonation of West Bengal



6.3.3 Hydrological units of the state

The state can be hydrologically recognized as three main basins (which are further recognized as 19 sub basins) namely:

- Ganga basin (Bhagirathi/Hooghly),
- Brahmaputra and
- Subarnarekha.

6.3.4 Surface water Availability

The state's utilizable surface water available from rainfall is estimated as 52,762 MCM. The existing major and medium projects accounts for 6,005 MCM and water detention storages accounts for 8,526 MCM. Consequently, the unutilized surface water is estimated to be 38,231 MCM. The 19-sub basin-wise catchment, utilizable availability of surface water, existing irrigation projects and water detention structures are given in Attachment 6.1.

6.3.5 Surface Water Sub-projects

The project plan to utilize about 120 MCM of the unutilized surface water (corresponding to 12000 ha-m) through setting up of approximate 3,407 surface water-based sub projects. This corresponds to 0.22 percent of utilizable and 0.31 percent of total unutilized surface water.

6.3.6 Irrigation Intensity

The net cropped area of the state is 52.05 lakh hectares which is 68 percent of the geographical area and 92 percent of the arable land. The cropping intensity is 184 percent. More than 15 lakh hectares (almost 30% of the cultivable area) still remain rain fed with single cropped agriculture practice. These are the undulating lateritic zone coastal areas and hilly terrains. These single cropped areas neither have irrigation nor are they getting assured rainfall. The productivity of kharif paddy in these areas is very low due to high variability and unreliable monsoon rains. The farmers in these areas are mostly economically poorest and proportion of tribal population is quite high. The state bordering Bay of Bengal and located in the humid tropical climate is often struck by natural disasters like floods, cyclones, hail storms etc. The district-wise cropping intensity is given in Attachment 6.2.

6.3.7 Selection of Schemes – Cluster Mode

The number and type of schemes are decided based on local situation need assessment using PRA methodologies. The Participatory preliminary selection of schemes will be facilitated by a multidisciplinary support service provider. The basic selection criteria are:

- willingness of the farmers to form a WUA;
- ability to maintain the irrigation infrastructure;
- agro climatological and socio-economic feasibility; and
- technical feasibility.

Application of GIS and remote sensing data to analyse agricultural pattern and hydro geological information of the village and the micro water shed will be used. This information is readily available in the web GIS maintained by the project.

Formation of WUAs with very few potential members (less than 10 households) will be avoided for management and sustainability considerations. However, for taking up very small sub-projects like small WDS,

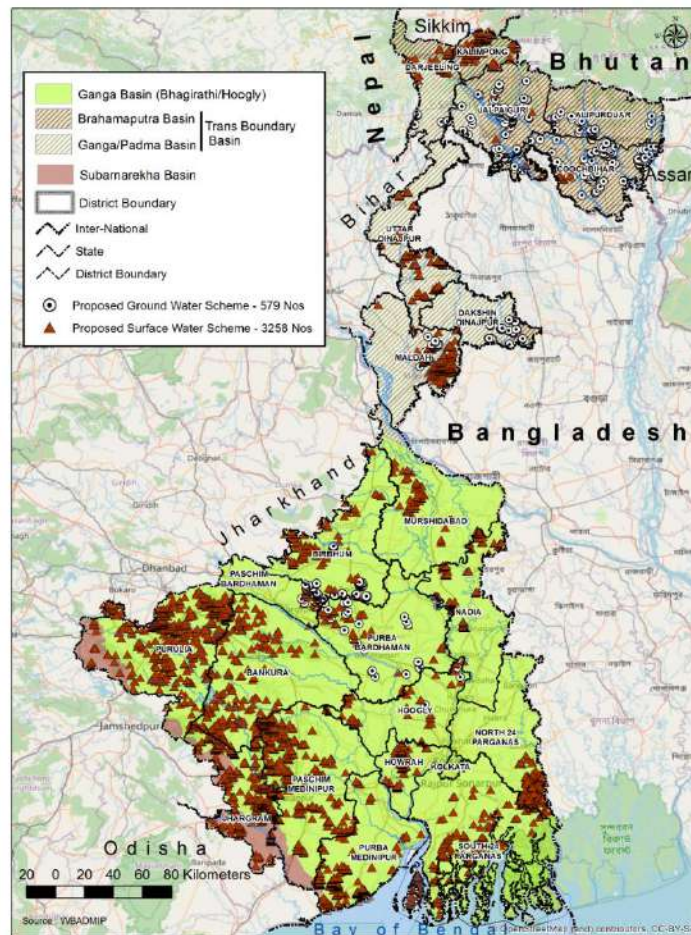
6.3.8 Irrigation Sub projects

The sub component will establish approximate 5,143 minor irrigation sub projects, out of this 1736 are ground water-based schemes and 3,407 are surface water-based sub projects. The irrigation potential created will be 30000 hectares. The CCA developed with surface water will be 13300 hectares and that with ground water will be 9,778. Besides, water storage ponds measuring about 500 hectares is planned to be used for fisheries.

The district-wise distribution of all schemes is given in Attachment 6.3

The proposed surface water subproject's locations depicted on the basin map of West Bengal is given in

Figure 6.3
Figure 6.3: Proposed MI Sub-project locations showing basin map of West Bengal



6.4 Tailoring Schemes to Geo Climatological and Agro Ecological Zones

During phase 2, the component will build on the five comprehensive geo-climatological and agro-ecological zonation models to integrate water management-based interventions to maximize returns for farmers.

6.4.1 Western Region

In Western districts, component activities will be to prioritize micro watersheds (<1000 ha) as a hydrologic unit, based on the land use, cropping pattern and existing water storage capacity. Integrated watershed plans will be prepared for improving water security in those regions and make them nutrient sufficient. A typical watershed shall have plantation in upland and diverse range of water harvesting structures to store the water and hence improve the access to water for various uses. The size of storage structures will vary with the terrain of watershed. In upland, it may include very small ponds (100 m²) while in lowland it may include storage structures of around 4 ha. These structures would have potential to serve command area of 1 ha to 10 ha while some will be conjunctively used for fisheries. Overall, the project is targeting to harness <10 MCM per micro watershed in storage structures that cumulatively have potential to serve 30,000 ha across the state.

6.4.2 Northern Hilly Region

In Northern Bengal hilly region, project will support spring shed management along with the land management and water recharge structures. The project will prepare integrated spring shed development plan to support the communities with the objective of ensuring improved access to water.

6.4.3 Coastal Regions

In coastal regions, the component activities will mainly include lowland storage structures referred to as water detention structures with a storage capacity of <10 MCM per micro watershed unit. These structures will be long and to be used conjunctively for both fisheries and agriculture with potential command areas of around 8000 ha. Additionally, the component will support small ponds for fisheries.

6.4.4 Choice of Schemes

The project will follow a judicious and cautious methodology for choice of schemes based on the agro-climatic and hydro-geologic zonation of the state based on the model zones developed during phase 1. The possible type of schemes to be selected in the different regions are shown in table 6.1.

Table 6.1: Scheme type selection guide based on Model zones

Model Zones and Districts	Hydro-geological and Agro-ecological Features	Critical Challenges	Main Scheme Types
1. Western Model: Red Lateritic Semi-Arid Zone (Paschim Burdwan, Paschim Midnapore, Jhargram, Purulia, Bankura)	• Red lateritic soil • Rainfall less than 1,400 mm • Temperatures 14.8°C to 37°C • Weathered zones and fissures having low yield • Seasonal rivers	• Dry/arid with erratic rainfall and extreme temperature • Single-cropped rain-fed areas • Poor market links • Technology-deficient area • Lands eroded, degraded and poor water retention capacities with low productivity • Predominantly tribal belt and people migrate for livelihood	Surface water schemes, including: • Series of check dams • Water harvesting tank [WHT] • Groundwater schemes (Dug well and tube wells) • Micro irrigation using Solar pumps
2. Coastal Model: Saline Coastal Zone (North 24 Parganas, South 24 Parganas and Purba Midnapore)	• Saline waterlogged areas • Rainfall 1,600 mm to 2,000 mm • Temperature 16°C to 35°C • Moderately thick confined/unconfined aquifer down to 150 meters having yield of 150 M³ per hour	• Rain-fed, single-cropped paddy belt • Ground water salinity • Migration due to extreme environment • Tidal inundation • Technology deficient	• Surface schemes (primarily deepening of coastal canals) • Water harvesting tank [WHT] • Micro irrigation using Solar pumps
3. The Central Alluvial Model: Vindhyan-Gangetic Alluvial Flood Plain Zone (East Burdwan, Hooghly, Howrah, Nadia, Kolkata, Murshidabad, North 24 Parganas, Malda, South Dinajpur)	• Fertile alluvial soil • Rainfall 1,400 mm to 2,000 mm • Temperature 15°C to 35.5°C • Fairly thick confined/unconfined aquifer down to 150 to 300 meters having high yield up to 150 M³ per hour	• Intensive agriculture-led to ground water contamination • Low water use efficiency • High population density	Integrated groundwater and storage development • Water harvesting tank [WHT] • Tube wells • Water management practices including micro irrigation using Solar pumps
4. Upper Plateau Model: Terai-Teesta Alluvial Flood Plain	• Terai soil	• Lesser ground water development against availability	Integrated groundwater and storage development • Dug well and tube wells

Model Zones and Districts	Hydro-geological and Agro-ecological Features	Critical Challenges	Main Scheme Types
Zone (Cooch Behar, Alipurduar, Jalpaiguri and North Dinajpur)	• Rainfall 3,000 mm to 4,000 mm distributed over 6 months • Temperature 12.8°C to 32.3°C • Confined/unconfined shallow aquifer 300 meters, high yield up to 150 M³ per hour • Perennial rivers • Incredible water availability	• Soil inundation during monsoon • Urban migration • High labour cost • Human-elephant conflict	• Water harvesting tank [WHT] • Micro irrigation using Solar pumps
5. Hilly Model: Hilly Zone (Darjeeling, Kalimpong)	• Brown forest soil • Rainfall above 4,000 mm (skewed availability) • Temperature 4.8°C to 19.5°C • Abundant availability of natural springs • Weathered zones and fissures having low yield	• Highly water scarce region • Inadequate tapping of water resources • Single-cropped rain-fed areas • Degraded soils • Chilling temperature • High labour cost • High urban migration • Technology deficient • Human-elephant conflict	• Diversion weirs • Water storage • Water management practices including micro irrigation • Jhora Water Management Scheme

6.5 Micro level Planning

6.5.1 Pre-planning

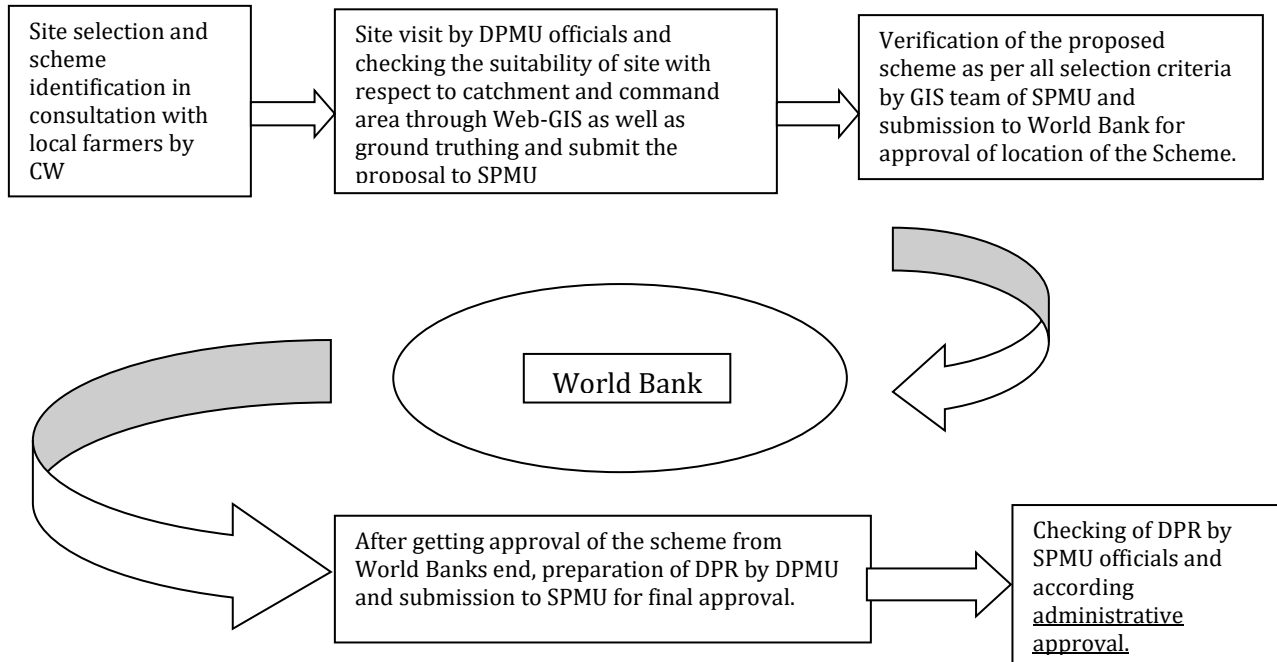
The project will adopt micro water shed based planning as the smallest unit of consideration. Within a micro water shed, the project will take up a cluster of sub projects. Such a cluster approach will aid not only effective supervision and monitoring but create more visible project impacts within the water shed. Wherever water shed approach is not feasible, a village wide approach will be resorted to.

6.5.2 Water Budgeting

Socio economic and techno commercial perspective of the area will be considered in selecting number and type of schemes. Water availability and water budgeting are the main consideration. The size and nature of the sub project will also be decided based on crop planning. Various crops have varied water requirement for their growth and to achieve desirable production levels. The project will assume that in general, a minimum of 0.25 m of water needs to be applied as irrigation for any crop season.

The process flow for micro level irrigation planning as emerging from phase I implementation and improvements thereon is summarized in Figure-6.4.

Figure-6.4: Process Flow for Micro level Irrigation Planning



6.6 Main scheme types

The main scheme types are:

- (i) Water harvesting structures – ponds or small-scale storage having capacities ranging from 400 to 10000 M²;
- (ii) Resectioning of creeks /Khal of length up to 1.5 km;
- (iii) Check dams of less than 3 m in height in small streams; and
- (iv) Open dug wells and tube wells;
- (v) Jhora schemes

In addition, the project will scale up water efficient technologies like flexible piped water supply, buried pipe water distribution, sprinkler and drip irrigation systems of improved conveyance and application system with efficient as well as low energy demands in about 10,000 hectares.

The project will promote conjunctive use of canal irrigation water with other on-site irrigation modes. Farmers will be allowed to pump water from canals and keep in storage for localized supplementary irrigation to save crops with critical irrigation.

The description of the main scheme types is as below:

6.6.1 Check Dam or Weir:

Check Dam is basically a weir, which a continuous solid structure is built across a stream over which water may flow. Weir impounds and raises water in the upstream side. Farmers harvest rainwater that is stored in the upstream and also percolates into the ground by using check dams, which restrain, or check, the flow of rainwater from catchment basins. Farmers use that water to replenish water supplies.

The concept of constructing a permanent check dam for irrigation purpose is comparatively new because traditionally check dams were constructed with low cost, low strength and non-permanent materials mainly for purpose of erosion control such as gully plugging on gullies. While demand for irrigation has been on a constant rise in draught prone areas where major, medium and ground water based minor irrigation projects are not feasible, necessity for constructing small permanent check dams was acutely felt on small rivers where traditional check dams prove to be unsuitable to cater the desired needs of irrigation. Since then, these types of small but permanent irrigation dams are constructed which are popularly known as check dam.

Although it is called as check dam, the basic hydraulics and structural design for such structure is same as for barrage or weir where need of a scientific approach guided by basic engineering principles remains. On the contrary, to be economically viable it is felt that many codal provisions, which are mainly meant for conventional barrage, weir, bridge and road culvert etc., need to be revisited. Considering its low impact on environment and very low severity on human settlement upon incidental, structural and hydraulic failure some modification or changes are allowed in the existing guidelines on the basis of past experience and performance of previously constructed check dams. However, with the easy availability of various data such as terrain, hydrology, land use, rainfall and with the help of remote sensing technology and other recent data the input parameters for design have become more realistic. This helps in factoring out of huge Factor of safety applied due to uncertainty of various metrological events and other topographical parameters. Photographs of check dams constructed during phase I is given in Figure-6.5.

Figure 6.5: Check Dams



6.6.2 Water Detention Structure (WDS)

A WDS is an artificial reservoir of any size and an isolated structure in an open space to retain water, which is utilized for agricultural purposes and development of pisciculture. It is also known as reservoir, tank, Water Detention Structure. The major objectives for construction of a WDS is to harvest rainwater and provide irrigation to the adjoining cultivable land and development of pisciculture activities. With the increase in vegetation, the indirect benefits may include recharge to the ground water, improvement in the soil moisture condition and improvement in the sustainability of Dug well.

These are earthen storage tank constructed by excavating earth to a depth 3 m to 6 m below Ground level.

Figure-6.6:Water Harvesting Tanks/WDS



WDS (Canal) These are also earthen storage structures constructed by excavating silted up existing creeks in coastal regions mainly in North 24 Parganas, South 24 Paraganas and Purba Midnapore. The photograph of **WDS (Canal)** developed is given in Figure-6.7.

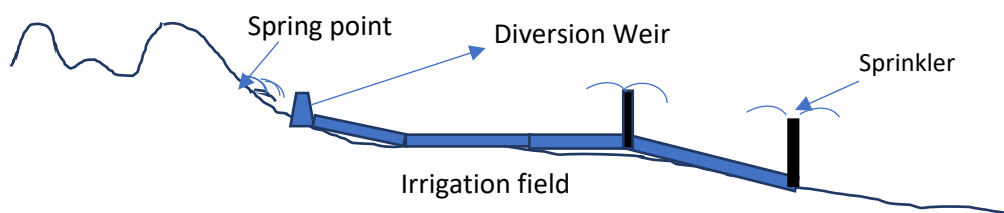
Figure 6.7: Development of WDS (Canal) as Water storage Structures



6.6.3 Diversion Weir (Jhora) Water Management scheme

Diversion Weir schemes utilize water of a natural springs in hilly areas of Darjeeling and Kalimpong District by **diverting a part of the natural flow of the springs by constructing** structures like weir etc and supplying the diverted water to irrigation field by GI or HDPE pipes using gravity head and storing the water in portable tanks. Sprinkler water distribution system is used for proper water distribution using residual gravity head.

Figure-6.8:Jhora



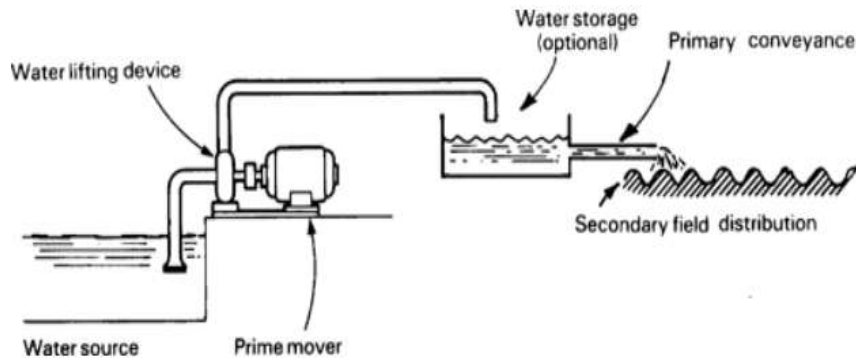
6.6.4 Lift Irrigation (Solar with micro irrigation)

Lift irrigation Schemes are installed where topography of land does not permit to construct storage of diversion works with gravity flow irrigation schemes. Water is lifted from the river with the help of pump-sets driven by solar driven pump-motor sets and delivered to field through underground pipe line network. Normally 5 hp Pump with 50 cum/hr discharge with 24 m head.

According to the bank conditions and the fluctuations of water level during dry and rainy season as well as other conditions, the pump sets have been installed in pump houses / steel barges / on portable trolley covered by detachable shroud. Main objective is to protect the costly pump sets from unfavourable seasonal weather conditions prevalent in this State.

Selection criteria: Any rain fed command area located above FSL of a perennial river or stream.

Figure 6.9: Lift Irrigation

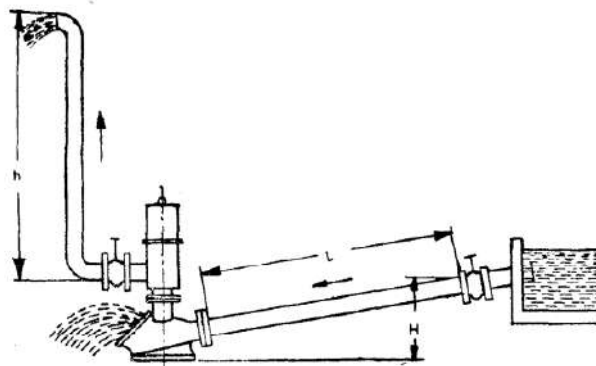


6.6.5 Hydram:

Hydram is an automatic device with which the energy of a quantity of water with small head is used to lift proportionate quantity of this water to a greater height. It works on the principle of water hammer. The unique feature of this kind of scheme is “**no energy cost**” is applicable.

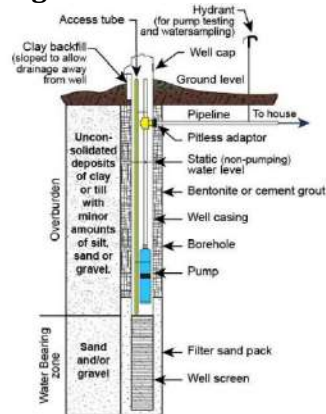
It is suitable for hilly areas where small command area ranging from 1 ha to 2 ha, is to be served and located at a height from the falling spring or stream which is Perennial.

Figure 6.10 Hydram



6.6.6 Tube well

Tube wells are constructed where suitable sub surface aquifer is located at a reasonable depth below Ground to extract ground water economically. Since, ground water is a limited resource, the decision of taking up a tube well to be taken in most judiciously when no other alternatives is available.

Figure 6.11: Tube well

Since the aquifer material is differently composed in different regions, the depth, average yield and design and cost of tube well will vary widely. For extraction of water from aquifer, external energy is required to drive pump-motor set. In this project solar energy-based pump is encouraged as much as possible.

6.6.7 Dug Well/Pump Dug well

Dug wells are simple water development structures. These are constructed normally to tap shallow water table aquifers with poor to moderate yield potential. A dug well should preferably tap a considerable thickness of the saturated zone. Dug wells are constructed by excavation and require a lining up to the depth to which the formation is loose and collapsible. In alluvial formation dug wells are lined along its entire depth.

Dug wells in hard rock formation are partly lined and receive water as percolation through the weathered and fractured rock aquifer. Static water level in a dug well is water table which rises and falls in response to the seasonal variation in rainfall. A dug well is dried up when the water table vanishes completely or recedes below the bottom of the well. High water level fluctuation is observed in a well which receives water from an aquifer having low permeability and vice versa. Centrifugal pumps are used most appropriate to extract water from dug wells.

Dug well is a typical excavated well which rest a thick layer with impervious masonry/RCC lining. Water is accumulated from bottom situated below water table. Such scheme should have recuperation rate of 75-90 CUM/day. Typical diameter in lateritic zone is 3 to 4 m and in Tarai region it should be 1 to 2 m. Photograph of a typical dug well structure is shown in Figure-6.12.

Figure-6.12: Dug Well



6.6.8: Type of scheme in Critical and semi Critical Blocks:

Activities under WBADMIP Phase -II for areas other than priority districts- Critical /Semi critical Blocks in West Bengal

Target Area: All 44 nos of Critical and Semi Critical Blocks - Murshidabad (6), Nadia (16), North 24 Pgs (8), Malda (1), Hooghly (3) Purba Bardhaman (4), Paschim Bardhaman (1), Paschim Medinipur (3) Dakshin Dinajpur (2)

Challenges: Over-extraction of ground water and lowering of water table

Approach: Optimum use of surface water and water use efficiency. Formation of WUA and Scheme clustering. All critical/semi-critical blocks will be taken up and will get prioritised as per the initiative shown by community.

Irrigation Infrastructure:

1. Construction of New Water Detention Structures (WDS).
2. Construction of Low-cost Poly House for vegetables/flowers.
3. Solar Operated Drip /Sprinkler /Buried Pipe network system using existing water bodies as water source.
4. Re-excavation of derelict water bodies/silted water channels.
5. Solar operated 2 H.P. pumps using ox-bow lakes as water source.

6.6.9 Type of Scheme for water management System in multi cropped area.

Target Area: Non-priority districts

Challenges: Improper water distribution system and flood irrigation; excessive use of fertilisers and pesticides

Approach: Scientific water management and improved water use efficiency. Formation of WUA and bridging the knowledge gap on water management and organic/natural farming. Progressive WUAs to participate in information dissemination in a hub and spoke model.

Suggested (main) Activities:

1. Construction of Buried pipe water distribution System from existing Tube well /surface lifting device.
2. Construction of Sluice gate for storing surface water in water channels.
3. Construction of Pucca Field channel in the command area of the major irrigation Canal Outlet and formation of WUAs.
4. Installation of Solar Operated Drip /Sprinkler scheme in existing water bodies.
5. Distribution of portable solar lifting device.
6. Construction of Low –cost Poly house for vegetables/nurseries/floriculture.

Other activities through Component C:

1. Supply of Tensiometer for measuring Soil moisture and information dissemination on water management through progressive farmers.
2. Testing of soil health and promotion of organic farming, natural farming, IPM etc.

3. Cash crop cultivation (viz. oilseed, groundnut, jute, green/black gram, black cumin, *Methi*) according to available Market on patches of high land where paddy is not preferred.
4. Construction of *vermi-compost* pits using bio-mass available in villages
5. Capacity building of WUA and lead farmers through knowledge sharing and exposure visit.
6. Identification and training of community resource persons (CRP) on tensiometer, organic/natural farming/IPM
7. Specific interventions to improve farming techniques for specific crops (viz. *jute*) on demonstration plots

6.7 Irrigation Planning

6.7.1 Existing/proposed irrigation facilities in the proposed command area.

Around 60% of the budget will be utilized in improving the availability of water for agriculture, agro-forestry and fisheries by developing new minor surface (65% of the schemes) and ground water (35 % of the schemes) irrigation schemes on areas that are currently cultivated under rain fed conditions. Unlike in phase 1, where the schemes command area ranges from 4 Ha to 24 Ha, there has been some amendments in the phase 2 where each proposed scheme to be undertaken will not exceed 10 Ha command area. Moreover, the schemes will serve the command areas which has less than 10% assured irrigation facility currently. During phase 1, Kharif season was assumed to be 100% rainfed so the surface water schemes were proposed targeting the dry Rabi season, however it was observed that due to climate change rainfall has been very erratic resulting in utilization of major portion of water resource during Kharif only. Since rice is linked to food security in the eastern region and paddy being the dominant crop during Kharif so availability of supplementary irrigation will also ensure climate resilience during the onset of erratic rainfall distribution pattern.

Hence, emphasis has been given in phase 2 where the kharif crops will get 100% assured supplementary irrigation and for Rabi season, tube well schemes will provide 100 % assured irrigation whereas surface schemes will have 60 % of water available for assured irrigation

6.7.2 Existing /proposed cropping pattern–season wise

Maximum of the areas proposed to be covered under the sub-projects are located in single cropped rainfed areas. In the existing practice, paddy is the main crop cultivated under rainfed conditions and is mainly connected to food security. One of the commonalities found in single crop rainfed areas is the apprehension towards adopting agriculture as livelihood. This is largely attributed by low productivity triggers by factors such as lack of assured irrigation, poor extension service and ignorance on available agriculture technologies. Existing and proposed cropping pattern season-wise is given in table 6.3.

Table 6.3: Season-wise cropping pattern

Crop Season	Existing Crops	Proposed Crops		
		Agriculture	Agroforestry (Including Horticulture)	Fisheries
Kharif Season	Paddy	Paddy, Maize, Black Gram	Vegetables, Plantation crop.	Water body area to be bought under fishery activity.
Rabi Season	Fallow	Oilseeds, Pulses	Vegetables	
Pre-Kharif season	Fallow	Boro Paddy, Maize, oilseeds	Vegetables.	

6.7.3 Existing area under rain fed cultivation

Maximum area of the command under this project is rainfed.

6.7.4 Net increase in the irrigation facilities due to project

Irrigation potential area proposed to be 30000 Ha through creation of new MI Schemes in which about 10000 Ha of irrigation potential will be covered through green energy mainly solar. Further through better water management practices & high value crop about 10000 Ha will be covered under the Project.

6.7.5 Water planning details, Conveyance & field application efficiencies.

For Conveyance and field application efficiencies, water will be distributed from the pump through lay flat hosepipe, buried pipe network to the farmer's field and it will be distributed with the unlined channel, however the quantity of water to be applied is to be determined in the field by the farmers with the help of soil moisture meter so that only volume of water to be applied with the soil can retain maximum and not get leached out. On the basis of application, the project will reach field water efficiency above 70%. Besides this drip as well as sprinkler system also will be given to the farmers from component C /B as well as convergence program under the department. Table-1 shows the water management of the project.

6.7.6 Participatory irrigation management, Water Users Associations, etc.

All the proposed schemes will be handed over to a committee or Water User Association after completion to assume responsibilities for their management, operation and maintenance including enhancement of water use efficiency by adopting suitable agricultural technologies for production and post-harvest management. Project will provide the following support to the Water User Association for smooth implementation of the deliverables:

- Providing social and institutional facilitation support to farmers in the command areas to mobilize and form WUA;
- Providing organizational development assistance and facilitation for strengthening WUA to help them carry out the intended roles;
- Providing technical facilitation to WUA in identifying and prioritizing irrigation development needs and selection of appropriate technology for addressing the needs including the participatory preparation of Scheme Development and Management Plan;
- Providing technical and capacity building services to WUA in accessing and adopting agricultural technology packages;
- Building capacity of WUA in management operation and maintenance of minor irrigation infrastructure;
- Facilitate preparation of manuals for: (i) organization development of WUA including by laws; (ii) management and operation maintenance of irrigation infra-structure; and (iii) training manual etc.;
- Providing facilitation support to women farmers and ensuring their active participation in project activities;
- Providing capacity building support;
- Facilitating participatory monitoring learning and knowledge sharing activities within and among WUA; and
- Facilitating preparation and implementation of water use planning, production planning, marketing plans and produce etc.

The implementation arrangement consists of: (i) Support Organization (SO) which are already in place to carry out all mobilization and organization development activities including capacity building and assistance in plan preparations: and (ii) the state Project Management Unit (SPMU) and District Project Management Unit (DPMU) are equipped with specialists' staff to monitor the SO services. Once the WUA is fully formed and capacity built, the project activities will be undertaken by the office bearers.

6.7.7 Micro-irrigation:

Complying by the per drop more crop strategy and water efficient farming, micro irrigation will be introduced as a part of protected agriculture like polyhouse under component C/B. In addition to that, convergence with State agriculture and horticulture department also will be undertaken to get a better outreach of micro irrigation initiatives. Apart from that the project will be promoting the real time assessment of soil moisture using tensiometer to increase the irrigation efficiency.

6.7.8 Drainage in the command:

The project area does not require any drainage facilities in the command.

6.7.9 Power requirements:

The project has planned to use solar energy for majority of the sub-projects for lifting irrigation water.

6.8 Survey and Investigation

The project will prepare detailed survey report in respect of reservoir, river, canals, water pipelines, command areas and other works in detail during final preparation of DPR. However, sample DPR of each type of schemes are being submitted where all kind of survey and investigation works have been shown.

6.8.1 Geological investigation:

The geological investigation is important especially for tube well schemes. The department has already had database of lithology surrounding each tube well project. Apart from that, detailed geo resistivity testing is also to be executed before execution of the tube well sub-projects. In case of check dam, detailed geological investigation was not taken up because of its very minimal size. During selection of check dams, fracture zones were avoided with the help of local geological maps, however further investigation by pit boring up to 3 m will be conducted to know the silt factor and type of soil deposited there.

6.8.2 Seismic investigation

All the structure under this project does not come under seismic consideration due to smaller sizes.

6.8.3 Foundation investigation:

Foundation investigation is required for check dams. Since the check dams are located in the region of undulated lateritic region, soil characteristics of these locations are very high in respect of foundation of check dam structure. The foundation soil in this area is mostly rocky in nature and/or sandy. However, the project conducted about 300 soil investigations in the locations proposed for Check Dams.

6.8.4 Construction material survey:

There is already a QA/QC team in place under existing project which will continue to carry out the material survey under the new project.

6.8.5 Construction Cost of projects

The construction cost of sub projects based on scheme types are given in Table 6.4 and 6.5

Table 6.4: Present Cost of Different MI Structures

Type of Scheme	Average cost (per ha of command area in Rs. lakh)
TW (S)	1.50 - 2.20
PDW (S)	1.00 - 5.50
CD	10.00 - 16.00
WDS	8.00 - 10.00
WDS(CANAL)	2.50 - 3.50
Jhora WMS	7.00 - 9.00

*Cost may differ due to escalation of price

6.8.6 Time schedule of execution of sub-projects.

The time schedule for implementation of different scheme types and duration are summarized in Table 6.5.

Table 6.5: Seasonality for Construction of Sub Projects

Type of scheme	Suitable time for construction	Duration
CD	Nov to June in each year	6 months
WDS	Nov to June in each year	1 to 6 months
WDS(CANAL)	Nov to June in each year	1 to 6 months
Dug well	January to May	3 to 6 months
TW	Nov to June in each year	4 months
LI	Nov to June in each year	4 months
Diversion Weir (Jhora) WM scheme	Nov to April in each year	1 to 3 months

6.9 Green Energy

The component activities will be to harness renewable energy sources in energizing pumping systems by supporting solar systems. This will help address the uncertainties in energizing lifting devices, reducing operation costs and benefiting from carbon foot print. Support to solar based pumping and improved water management interventions will be for both new and old schemes. Water management interventions will include improved conveyance system through portable solar pumping system, flexible piped water supply, introduction of sprinkler and drip irrigation. About 30 percent of the sub projects will be using green energy including solar based irrigation pumping systems.

6.10 Innovative Technologies

The GIS and remote sensing-based methodologies systematized during phase 1 will be fine-tuned for prioritizing areas and planning activities under the component. The component will use simplified and standardized design models and technology improvements established in phase 1. The component implementation will benefit from web and GIS based MIS and monitoring of the component activities including participatory hydrological monitoring and quality assurance mechanisms.

6.11 SDMP

The participatory preparation of site-specific constraint identification, water security planning for resource renewability and conservation as well as livelihood planning for farmer income enhancement successfully implement

6.12 Guidelines for Design of MI Structures

The detailed guidelines for the design of various MI structures like check dams, water detention structures, dug wells, checklist for sub project preparation and approval, financial delegation, procurement procedures are given in Attachment 6.4.

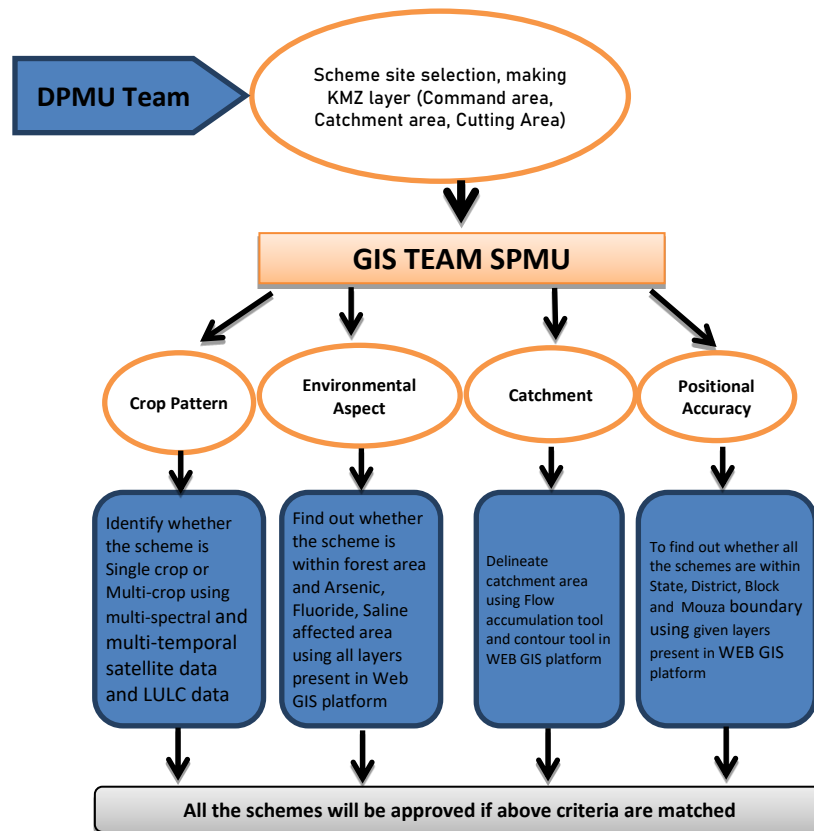
6.13 Role of GIS in the Project

During phase I of the project, the project utilized innovative GIS technologies for investigation, design, development and monitoring MI schemes which was unparalleled in the state.

6.13.1 Role in Scheme Selection:

Scheme data provided by field staffs are checked for correctness using Web GIS platform by superimposing different GIS layers like International Boundary, Administrative Boundaries, Road, Railway and Drainage network, Land use and land cover, Soil texture, Forest layer, layer of Agro-climatic zone, Generation of micro-Watershed boundaries and Flow Accumulation layer (catchment and slope) from Digital Elevation Model (DEM) data. Such analysis is necessary to identify suitable scheme site as well as scheme type. (i.e Surface Water schemes & Ground Water schemes). The schematic diagram for scheme selection is given in figure 6.13.

Figure 6.13: Role of GIS in Scheme Selection



6.13.2 Role in Approval of Schemes:

Based on GIS data analysis as stated above, approval is given for implementation of individual schemes. This is one of the most critical contributions of GIS Team, as effectively of the entire Project depends on how well the individual scheme sites/locations are chosen.

6.13.3 Role in Scheme Progress Monitoring:

Linking project MIS with the GIS server so that every update from the DPMU/SPMU is reflected in the enterprise GIS and its web apps on a real time basis. Time series satellite image data is also analysed to monitor the scheme progress.

6.13.4 Role in Scheme Performance Monitoring:

Once the schemes are handed over to beneficiaries, its performance with respect to productivity (crop acreage and change in cropping intensity) is tracked and monitored on a continued basis with the help various time series data obtained from satellite images.

6.14 Water Use Efficiency

The project will emphatically monitor water use efficiency both at the farmer level and basin level. Surface runoff discharge, extraction and evaporation will be monitored using innovative tools. Attempts will also be made to prepare water security plans for villages. In WDS localised efforts to find suitable site will be the approach. In all water harvesting schemes 30:40 model for plantation will be practised including upper catchment treatment and soil conservation measures. In dug wells, infiltration galleries will be used for recharging.

6.15 Booking of Expenditures

All the expenses related to the component B are expected to be booked under the approved Component B budget head of accounts. It will includes all the expenses as mentioned below

- Works- All the MI scheme related expenses as per the contract awarded
- Goods- All the engineering equipment's, tools & software etc required to improve the efficiency & effectiveness of the engineering team/Cell and
- Services- All the expenditures such as survey, consultancies etc carried out for the MI scheme selection, implementation, evaluation etc

7. COMPONENT C: AGRICULTURAL SUPPORT SERVICES

The state is already affected by climate change on agriculture livelihoods, and the triggers are variability in rainfall and rising temperature. The direct impacts are lowering crop production and productivity, leading to food security and nutrition issues ultimately volatilizing farmers' incomes etc. The climate vulnerable and stressed areas are worst affected. Consistent with the national and state policies on agriculture and to reduce the effects of climate change induced vulnerabilities, the component-3 Agriculture Support Services has been designed following the principles of Climate Smart Agriculture (CSA).

7.1 Experience from Phase I

WBADMI Project was about transforming rainfed farmers to irrigated farmers. The project objectives were to enhance agricultural production of small and marginal farmers in the project area. By providing minor irrigation infrastructure and services in single cropped Kharif areas helped farmers raise cropping intensity and achieve crop diversification. The project selected paddy, pulses and oil seeds as focus crops initially and later focused on oil seeds and vegetables for crop diversification. The area productivity and production of all the three crops consistently improved across seasons. The major agriculture activities carried out by the project included demonstration of agriculture, horticulture and fisheries production technologies and practices. There was systematic introduction of crops like sweet pea, broccoli, cauliflower, sunflower, baby corn, capsicum etc., and protected cultivation with precision irrigation. There were efforts for farm mechanization, promotion of good agricultural practices to produce safe to eat fruits and vegetables. On similar lines with farmer field schools project also mobilized farmer water schools for better management of irrigation water. The project promoted market led production system and brought in strategic partnership and collaboration with major private sector players. The agriculture support services will build on the achievements of phase I.

7.2 Critical Constraints

More than 80% of farmers in the state belong to small and marginal categories who are worst affected by climate change, access to irrigation and face technological challenges. Average holding size of farms is 0.76 hectares² that too fragmented into several small parcels. Access to improved technologies and quality inputs including seeds are also major issues. Lack of market access, poor post-harvest handling facilities affect price realization of the produces. Organization development of farmers for collective farming efforts and better bargaining power also need attention. The constraint analysis of the sector is in table 7.1

Table 7.1: Constraint Analysis of the Agriculture Sector

Human and Social Factors	Input related
• Predominantly small and marginal farmers • Rain-fed sustenance farming -Western districts • Less awareness on good agricultural practices • Migration to non-farm activities • Traditional extension services by line dept	• Quality seeds and input availability • Continued use of traditional production and water management practices • Availability of seed/planting materials of improved varieties • Less than adequate use of farm implements
Post-harvest aspects	Environmental aspects

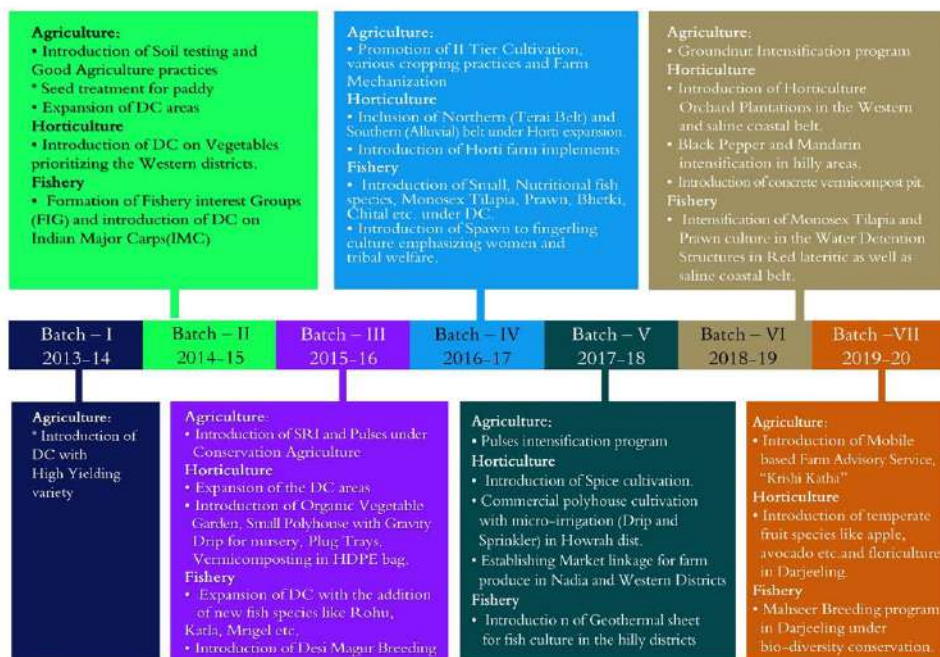
² Department of Agriculture, West Bengal

- | | |
|---|--|
| <ul style="list-style-type: none"> • Poor integration of supply chains • Poor access to market information-price, demand • Lack of market linkages • Lack of agri-business enterprise orientation | <ul style="list-style-type: none"> • Indiscriminate pesticide use • Degradation of soil health • Inadequate use of organic methods • Lack of attention on sustainability |
|---|--|

7.3 Timeline of ASS Activities

The project introduced several innovative activities on a gradual manner over the phase-I timeline as shown in Figure 7.1.

Figure.7.1: Phase-I Timeline showing Introduction of ASS Activities



7.4 Objectives

The component has four-fold **objectives**:

- To improve productivity and sustainable production of crops and fisheries for ensuring food security, balanced nutrition and stability in farm hold incomes;
- To better resilience with climate change adaptations through crop diversification, use of innovative technologies and use of hydro informatics for farming decisions; and
- To reduce GHG emissions from agriculture by promoting fruit tree plantations and other land managing practices, soil health management and other carbon sequestration technologies.

7.5 Outcome Indicators

The main expected **outcome indicators** from the component activities are:

- Crop diversification index to measure cultivation of diverse species than mono culture grain crops;
- Increase in tree cover from new areas brought under cultivation of fruit trees and other plantations of economic value;
- Proportion of paddy cropped area brought under water use efficiency technologies like AWD, direct seeding, life-saving irrigation at critical crop growth stage;
- Number of farmers adopting precision irrigation and protected agriculture;

- (v) Area brought under carbon sequestration land management practices for improving soil health-composting including vermicomposting, crop rotation with leguminous crops, green leaf manuring, GAP, etc.;
- (vi) Water productivity measured in physical terms (PWP) kilograms of bio mass production per m³ of water and Economic Water Productivity (EWP) as INR per m³
- (vii) Changes in the food habits of beneficiary farm households by inclusion of pulses, oilseeds, vegetables, fruits, fish-high energy carbo hydrate rich food to more of proteins, vitamins and minerals.

7.6 Component Activities

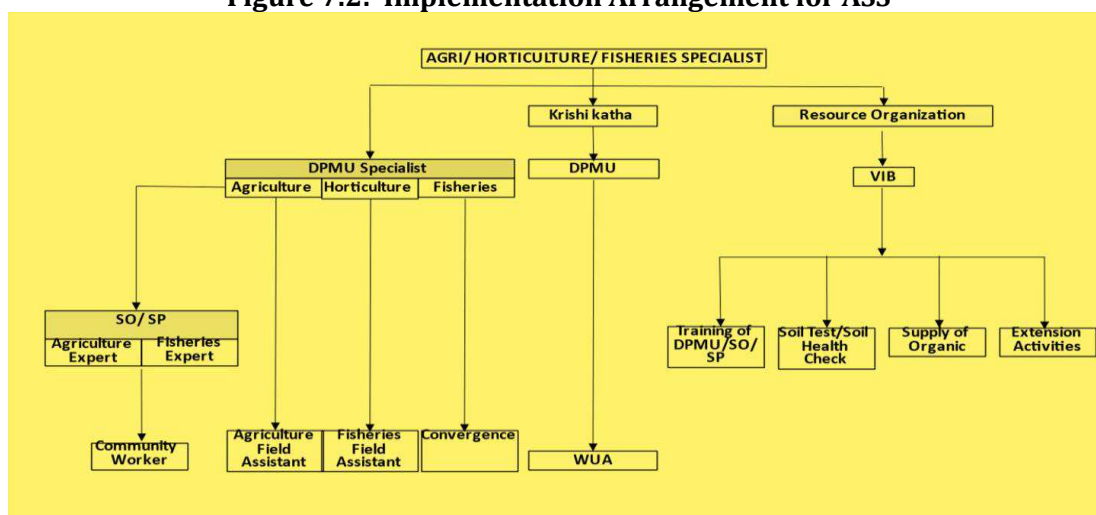
The project will promote adoption of improved production technologies, water management practices, field demonstrations, effective delivery of key support services including farm advisory. There will be focused attention on high yielding and high value varieties, improved husbandry practices, better water resources management, integrated soil fertility and nutrient management, integrated pest management and good agricultural practices (GAP) and post-harvest technologies and farm mechanization. The other key activities include:

- (i) Organizing demonstrations of pilot innovative technologies and encouraging adoptions through training, organizing field days;
- (ii) Promoting village level mass adoption of climate smart technologies like 'compost villages', 'pulse villages', 'indigenous fruit tree villages', 'fossil fuel free agriculture' villages etc.;
- (iii) Providing market information on demands, prices, produce qualities etc. through convergence at WUAs as input information for crop planning and land use; and
- (iv) Linking WUAs to state hydro informatic information portals to use soil, water, climate related information in crop planning.

7.7 Implementation Arrangement

In terms of implementation, the project will facilitate convergence of the state-run extension services, private sector and research institutions, NGOs using WUA as institutional platform. The WUAs will be clustered, networked and linked to other farmer producer organization for sourcing production inputs including improved seeds, seedlings and fingerlings etc. The project level facilitation and day to day operational management of the component will be by specialists at SPMU and DPMU level. The SO/SP will coordinate activities at the WUA/cluster of schemes level. The implementation arrangement is summarized in Figure 7.2.

Figure 7.2: Implementation Arrangement for ASS



7.8 Areas of Improvement over Phase-I

Compared to phase-I activities there are several improvements in the design of phase-II ASS activities. The broad areas of improvement and the specific changes for activities are summarized in Table 7.2.

Table 7.2: ASS Activities Comparison with Phase-I

Phase-I ASS Activity	Improved Phase-II ASS Activity
I. Agricultural Practices	
<u>a. Soil testing with issuance of crop-wise soil health card</u>	
i. Soil testing 20% WUA covered	i. By end of Phase-II 50% to be covered
ii. Crop-wise soil health card 3% WUA covered	ii. 25% of WUAs will be covered for crop-wise soil health
<u>b. Bio-input production</u>	
i. Organic agents for seed treatment	i. 100% organic agents at cluster level organic bio-agent production will be taken up by WUAs from locally available materials with 70% investment from project and 30% from WUA.
<u>b. Seed screening and seed treatment with organic inputs.</u>	
i. 80% WUAs covered with chemical inputs	i. 100% WUA will be covered with organic inputs like Trichoderma, Pseudomonas
<u>c. Seed preservation</u>	
i. Seed preservation with local materials in five western lateritic districts only, 36 lead farmers trained for local production of seed treatment organic inputs.	i. Will be scaled up to other districts and to cover at least 50% WUAs. Production units at regional levels will be set up.
II. Replacing Chemical Fertilizer with Organic Green Manure	
<u>Introduction of Daincha, Asola and Vermi compost</u>	
600 hectares covered on pilot basis in all districts in Kharif season	Will be scaled up to 6,000 hectares covering all districts.
III. Natural Farming	
Taken up in 6 districts involving 11 WUAs on pilot basis.	Will be scaled up through GOIs Paramparagath Krishi Vikas Yojana (PKVY) targeting 50 hectare coverage in each WUA with due certification.
IV. Kharif Paddy	
Focus was to promote drought resistant short duration variety of kharif paddy especially in western lateritic districts.	10,000 hectares of districts specific indigenous aromatic variety of paddy will be cultivated with organic mode of cultivation expecting two times profitable than HYV.
V. Kharif Pulse	
<u>Cultivation of pulses and oil seeds in Kharif season</u>	
i. Black gram covered 1,000 Ha in western lateritic districts.	i. A total of 15,000 Ha will be covered with pulses and oil seeds local varieties across state.
ii. Ground nut covered 500 Ha in four districts	ii. Ground nut will be covered in 2,000 Ha.
	iii. the expected yield will be 1.54MT/Ha

VI. Rabi	
i. Covered about 10 percent of total command area of the project with pulse cultivation with rhizobium culture and PSB	i. 30 percent of the command area will be covered with pulses.
ii. Pulse crops like Lathyrus as Paira crop in four districts and lentil, green gram Bengal gram was grown in five percent of total command area.	ii. Expected yield will be 1.32MT/Ha
iii. 12 percent of the command area was cultivated with oil seed, groundnut, mustard and sunflower with average yield of 1.02MT/Ha	iii. Expected yield will be 1.54MT/Ha
VII. Pre-Kharif	
5 percent of the CCA was cultivated with sesame and groundnut	Will be scaled up to 10 percent of the CCA
VIII. Scientific Water Management	
<u>Use of Soil Moisture Meter (Tensiometer)</u> 75 WUAs provided with tensiometer with 80percent payment by project and 20 percent by WUA.	50 percent of WUAs will be provided with tensiometer with proper training and demonstration (sharing cost of 50 percent by project and 50 percent by WUA)
IX. Seed Production and Certification	
Not taken up	Seed production and certification program will be taken up in three agro climatic zones of the state.
X. Master Trainers / Farmers	
Development of master farmers	A graded leading farmers will be trained as master trainers especially in organic farming who will build capacity of other farmers as para professional in other WUAs. Such farmers undertaking capacity building in other WUAs will be compensated with Rs. 500-700/day as per their experience and competence which will be initially met from project and later on by the WUAs hiring their services.

The component implementation will also be improved in comparison with the phase-I activities on the following lines:

- (i) Agriculture support services including marketing services will be through linkage with farmer producer organizations;
- (ii) Crop diversification will be further strengthened through introducing high value water saving crops;
- (iii) More focus on precision farming to save water, sustaining soil health and cost-effective nutrient management;
- (iv) High value horticulture promotion for small producers through federated farmer institutions;
- (v) Focus on climate mitigation practices-soil health, tree cover, plantation management etc.
- (vi) Increased use of hydro informatic information in crop planning, soil and water use management; and
- (vii) Focused intervention in inland fisheries with modern technology practices including storage, transportation and marketing.

7.9 Technical Guidance Manual

In addition to operational information provided in the PIP, the technical units of agriculture, horticulture and fisheries will produce a technical manual describing the detailed technical programs specifying varieties, farm models, criteria for beneficiary identification, key rules, project financial assistance, process steps etc. Initially, these are issued as technical bulletins covering the three sub components. By MTR, these will be compiled to form technical guidance manual.

7.10 Sub Components

The agriculture support services will be implemented in three sub components:

- (i) Sub Component C1: Agricultural Crop production;
- (ii) Sub Component C2: Horticultural Development; and
- (iii) Sub Component C3: Inland Fisheries (Aqua Culture) production

7.11 Sub Component C.1: Agricultural Crop Production

The project will promote husbandry of traditional crops like cereals, pulses and oil seeds among farm holds in the command area of minor irrigation schemes/clusters.

7.11.1 Objective of the Sub Component

The aim of the sub component is to increase production, accelerate intensification and achieve diversification of crop production system. The sub component will be promoting cultivation of high yielding crop varieties, better agronomic practices and water resources conservation technologies including micro irrigation. The sub component will also promote integrated soil fertility and nutrient management, integrated pest management and organic farming techniques/Good Agricultural Practices.

7.11.2 Activities

The activities under the sub component include:

- (i) Promoting a pluralistic demand led extension system for field crops;
- (ii) Technology demonstrations; and
- (iii) Facilitating Input supply through WUAs;
- (iv) Support for farm mechanization;
- (v) Facilitating produce handling and market linkages with wholesalers and food manufactures.

- **Crop planning:** The project will encourage crop planning in the command areas of schemes taking into account seasonality, availability of rainfall, market opportunities etc. In the command area of schemes wherever possible commercial aromatic paddy cultivation will be maximized during Kharif. Outside of the command area in the upland and cultivable fallows cultivation of pulses, oil seeds and seasonal vegetables with climatic resilient technology will be followed.

- **Organic/natural farming:** The project will promote natural production practices without extensive use of chemicals, protecting the soil, preventing environmental degradation, producing health produces and with a certification process. The main practices for organic/natural cultivation include soil testing, seed treatment with bio inputs, increased use of organic fertilizers, like vermicompost, use of bio pesticides like neem oil, GAP like timely sowing, proper spacing etc., crop rotation, mixed and phased cultivation. Appropriate linkages with the natural farming program of Government of India will be established for certification and incentivizing farmers adopting

organic/natural farming. Cluster level organic bio-agent production from locally available material will be promoted.

- **Small scale farm mechanization:** The project will implement programs for promoting use of farm machinery and implements to reduce drudgery, save time and save costs. The type of machines which will be promoted include power triller, paddy reaper, motorized paddy transplanter, motorized paddy weeder, drum seeder, SRI markers, cono weeder, single wheel hoe, groundnut decorticator, hand driven maize sheller, double gear paddy pedal thresher, battery operated sprayers, small milling centers, micro-oil extraction units etc.

7.11.3 Implementation Arrangement

The Government of West Bengal has taken a policy decision instructing different departments to work convergently with WBADMI Project, Tribal Welfare Department, Horticulture Department, Department of Agriculture etc. As a result, detailed guidelines have been issued by these departments to work in convergence with the project and dovetail activities at WUA level. The SPMU is facilitating for smooth convergence at the state level and troubleshoot for issues at district level.

The current institutional arrangement at SPMU consists of consultants who had worked as senior officers of the Agriculture Department and KVKs. This has helped in developing convergence with various programmes run by Agriculture Department like ATMA, Pradhan Mantri Krishi Sinchayee Yojana (PMKSY), State Agricultural Universities (SAUs). In addition, the DPMU is maintaining its convergence and contact with district level officials of the Agriculture Department and backstopped by SPMU.

The WUA will be functioning as 'one stop convergence' for the agricultural support services. The state agriculture extension services, KVKs, research institutes and other agencies involved in agriculture extension, technology support, input supply etc. will be coordinated at the state and district level by the experts deployed within the SPMU/DPMU. The SO/SP will also have an optional agriculture expert, community workers who will do the facilitation at the WUA level. At the WUA level, there are master farmers specializing different aspects of agricultural support services, who will also be providing assistance. At the cluster of WUA level, also in linkages with farmer producer organizations inputs will be sourced at negotiated price for the farmers.

7.11.4 Key output/outcomes

The main expected outcome is extent of irrigated area cropped more than one season and practicing land use planning, irrigation scheduling, crop rotation, GAP and soil conservation and soil health management practices.

7.11.5 Mitigation Strategies in Phase-II

Considering the various challenges identified during phase-I, the phase-II ASS activities will deploy the innovative strategies detailed in Table 7.3.

Table 7.3: Risk Mitigation Strategies under ASS Activities

Challenges	Strategies from Project
Irrigation	
Rain dependent	Assured
Farm Income	
Single cropped lowland cultivation	Upland cultivation during kharif for additional farm income, Tapping Rabi and Pre-Kharif season for production of pulses, oilseeds and vegetables, Production of cut-flowers under Polyhouse in the high hills, Mixed fruit cultivation with intercropping.
Crop Improvement	
Low yielding traditional paddy variety	Replace with high yielding paddy variety such as Shahbaghi, MTU 7027, Shatabdi etc
Uncertified local seed	Introduction of certified HYV seed through demonstration centre, Seed Preservation
High Seedling mortality	Promotion of Seed treatment
Crop Management	
Poor Soil Nutrients	Balance use of fertilizer dose, crop rotation
Indiscriminate use of pesticides	Adoption of Integrated Pest Management (Mechanical, Biological and Chemical)
Agri Water Management	
Flood irrigation	Use of PVC pipe for delivery, Bunding, SRI, Direct Seeding with Drum seeder, Paira cropping, Use of Tensiometer etc
Soil Health Management	
Degrading soil fertility	Soil Health card, Use of Vermicompost, Cultivation of Green manure crops like Dhaincha
Cost of production	
High labour cost	Introduction of farm implements
Sustainable Land Management	
Fallow and cultivable wasteland	Introduction of pulses and oilseed cultivation, Horticulture Orchard Plantations, Intercropping,
Advisory Service	
Non-Available	ICT materials, Launching “Krishi-katha” a mobile based farm advisory service

7.12 Sub Component C.2: Horticultural Development

Access to irrigation opened opportunities in rainfed single cropped areas growing traditional crops, to grow vegetables, fruit trees, flowers etc. Even in drier areas, water harvesting and storage will make it possible to draw tree plantations, fruit trees which require very less water than field crops. Therefore, horticulture will be further intensified under the project.

7.12.1 Experience from Phase I

The scope for horticulture activities was opened due to availability of assured irrigation water and activities like demonstration centre for seasonal vegetables, raising high value vegetable crops in poly houses with micro irrigation, raising mixed fruit tree plantation in cultivable fallow lands, growing floriculture in poly houses, taking up vermiculture individually and in groups were the main activities taken up under horticulture component. Some of these scientific practices introduced

include improved varieties of vegetables, cultivation of cash crops like water melon, high valued vegetables etc., use of micro irrigation, organic seed treatment, use of mulching techniques etc. The phase II Horticulture Development Activities will build on the experience from phase I and the key improvements are summarized in Table 7.4.

Table 7.4: Horticulture Development-Experience from Phase I reflected in Phase II

Horticulture Activities	Phase I Experience	Phase II approach
Water management	Used very sporadically	- Optimal water use practices will be implemented widely: - Use of tension-meter. Cost sharing 50% Project and 50 % WUA/ Farmers /SHG; - Use of straw, single use poly mulching or other mulching technique 100% coverage; - Use of drip & sprinkler irrigation system from ADMI project and in convergence with PMKSY taken up Agri. Dept. Govt. of W.B.
Demonstration Centres (DC)	Provided seeds and critical inputs of seasonal varieties of vegetables	Will be conducted on efficient use of irrigation water, IPM, organic vegetables production etc.
Mixed fruit tree plantation	- In cultivable fallow lands zigzag trenches, hapas, WDS were dug to retain moisture; - Mixed fruit plantation of mango, cashew, jackfruit, guava, lemon, mosambi, papaya, coconut, areca nut, ber, dragon fruit etc was established; - Soil moisture is further retained by use of organic manures like vermicompost, neem cake etc. which enhanced sustainability of trees (90%); and - Land areas of 2117 hectares were covered with 60% intercropping with vegetables, pulses and oilseeds.	- Programme for plantation management for all the WUAs; - Target will be enhanced to 2000 Ha.; 100% of plantation area to be covered by intercropping; - Post-harvest management techniques will be introduced; and - Aggregation of produce with market linkage will be undertaken.
Floriculture	- In few districts introduced in a limited way; - Included cultivation of Rose, lotus, chrysanthemum, Gerbera, Carnation, Gladiolus, anthurium etc ; and - Total coverage was only 18.48 Ha.	- More diversification and bringing more area in this phase both in open field and poly house; and - Water chestnut, Fox nut will be introduced under waterlogged areas.
Low-cost nursery with shed net	WUAs and women SHGs raised vegetable seedlings using low cost bamboo structured poly houses;	- Low-cost nursery with shed net for vegetables will be encouraged; - Nurseries of plantation crops like mango, cashew, betelnut, black pepper, mandarin orange etc. will be promoted; and - Soilless medium in cocopeat and pluck tray will be used.
Sericulture	Arjun plantations raised in 50 Ha.	- In suitable locations WUAs/women SHGs will be supported; and - Targeting 150Ha with Arjun plantations with tasar silk worm (<i>Antheraea mylitta</i>) cultivation.

Bee keeping	• Promoted as a natural complimentary activity along with agriculture and horticulture; and • Master trainers developed to support the activity.	• Will be scaled up in about 1700 WUAs and SHGs to cover about 2000 farmers.
Small scale village industry	• Not initiated	• Non-timber minor forest produces based village industry like sal plates making, lac collection etc. will be taken up by WUAs in feasible areas.
Spices and other Horticulture crop cultivation	• Not initiated	• Spices and other horticulture crops will be encouraged.

7.12.2 Objectives

The aim of the sub component is to promote diversification to high value fruit, vegetable, flowers, spices and condiments, fruit crop plantations, through value chain development. The sub component will help resource poor farmers who are assured of irrigation services to participate in and benefits from high value horticulture supply chains. Water saving and resource efficient technologies like precision farming, soil health enhancing practices, CHG practices like tree cover, integrated pest management, good agricultural practices etc. will be increasingly used in horticultural practices.

7.12.3 Main Activities

The farmer institutions help risk profiling of farmers and encourage them to select crops based on market demand depending upon the risk exposure. Small producers will also be helped to access innovation in production technologies, critical production inputs like hybrid seeds, planting material etc. and also to benefit from buy back arrangements, contract farming will be promoted in partnership with reputed companies. The component will also promote post-harvest management system to meet with market standards of quality of the produce and to minimize losses. The federated farmer institutions will be supported for piloting post-harvest facilities for grading, packing, branding, storing and transporting produce. The good agricultural practices, soil fertility and health measures and integrated pest management will be practiced. Precision farming practices including micro irrigation, protected crop raising will be attempted.

- **Climate resilient vegetable cultivation:**

Low-Cost Model Nursery - The project will help farmers raise healthy seedlings under relatively controlled weather conditions in pluck trays, using low-cost nurseries. The seedlings will be sold to farmers to help them plant early and harvest on time for the market avoid glut seasons. The project will also implement demonstrations centers for application of technological inputs like vermicompost as base fertilizer, poly-mulching, use of tensiometer for water management, IPM etc.

Low-cost shed net - To avoid effect of frequent natural aberrations cultivation of high valued vegetables in low-cost poly shed is very profitable livelihood activity. Early production of vegetables and flowers will be able to fetch extra prices to the farmers of WUA as well as crop will be protected from monsoon rain and other natural calamities within the Poly shed.

- **Poly house for High value Vegetables:** The project will provide seeds, fertilizers, tools and equipment for building poly houses for vegetables to WUA. Poly house with drip irrigation system for cultivation of high value crops like capsicum, seedless cucumber, cabbage, cauliflower, coriander leaves, lettuce, broccoli, red cabbage, cherry tomato, snaky pepper etc. will be implemented. The

project will facilitate 100 percent buyback contract arrangement for poly house cultivation. Project will also provide intensive training and practical guidance on poly house on high value vegetable cultivation in poly houses. Technical support will be provided through WUA.

- **Model Vegetable Demonstration Center** - Demonstration Centres of vegetables will be conducted with the seedlings of vegetables and other crops produced in the low-cost nursery. Organic Fertilizers and other Bio-inputs, I.P.M. technologies and mulching technologies will be followed in D.C. implementation.
- **Poly house for floriculture:** Expanding and scaling up successful poly houses for floriculture implemented during phase I will be attempted under the project. Poly house with hydraulic ramp pump or hydram with prefabricated water silos will be used as source of irrigation. The flower species of Gerbera, Carnation, Chrysanthemum, Rose, Gladiolus, Anthurium etc. will be grown. The eligibility and key rules are like poly houses for vegetable cultivation.
- **Open field Floriculture:** This area of horticulture has immense potentiality as an alternative livelihood generating activity for very marginal farmers having as small as one and half bigha or 2 bighas of land with irrigation facilities to take up floriculture in the potential districts like Howrah, Nadia, Purba Medinipur for cultivation of Gerbera, Rose, Chrysanthemum, Lotus and Gladiolus etc.
- **Mixed Fruit Plantation development:** Uplands and coastal lands kept fallow will be identified for raising mixed fruit plantation with water conservation structures like zig-zag trenches, hapas for arresting run off and retaining soil moisture along with Neem and Arjun plants around the orchard. The project will make available through WUA good quality saplings and other inputs. In addition, to generate employment labour support will be provided for planting and post planting care including intercultural operations and inter cropping. The project support will be restricted to initial years of the plantation and later the farm owners take it up as an economic activity.
- **Promoting Farm machinery and implements:** Different types of machinery and implements will be made available at WUA level for hiring to individual farmers with hiring charges to meet operational and maintenance expenses.
- **Low-Cost models of Vermicompost:** Selected farmers in different WUAs took up vermicompost, which sustain yield of crops and improve soil health. This will be scaled up using low-cost vermin pit. Individual farmers will be trained to produce own vermicompost.
- **Bee keeping:** The project will support farmers of WUA for raising local strain of honey bee wherepossible. Farmers will be supported by supplying honey bee boxes with bee colony. Farmers interested in apiary will be given technical training and skill building for seven days with identified institutes. In addition to Paschimanchal and Darjeeling, the districts of Malda, Murshidabad, Nadia, South 24 Parganas, North 24 Parganas, Hooghly, Howrah, Paschim Midnapur, Purba Midnapur and Bardhaman will be covered. The concept of master trainers will be employed to help bee keeping farmers through WUA. Appropriate buyback and marketing linkages will be facilitated.
- **Sericulture:** Mainly Tasar cultivation will be promoted in Western laterite districts in Arjun plantation. Tribal women farmers will be encouraged in Tasar cultivation.

- **Horticulture Seed Production:** Seed production of Elephant foot yam corms will be introduced in 2nd phase for income generation of WUA members. Tissue culture seedlings will be supplied to the farmers for seed corm production.
- **Fruit Nursery:** To procure good quality saplings of fruit trees establishment of fruit nurseries will be encouraged at WUA level. Required saplings will be purchased from the nurseries at WUA level by following community procurement rules. In the 2nd Phase nurseries of Mango, Cashew, Mandarin Orange, Coconut, Betel Nut and Black pepper will be established at different districts to meet requirement of fruit plantation Programme.
- **Spice and condiments cultivation:** Spice cultivation is an area from where WUA can earn significant amount of earnings easily. There is a scope of cultivation of Ginger and Large Cardamom in Darjeeling and Kalimpong districts and Black pepper, Bay leaf, Cinnamon at Jalpaiguri and Cooch Behar Districts. And similarly Turmeric, Garlic, Onion, Coriander, Fenugreek and Funnel etc. are suitable for South Bengal Districts. Another two condiments like Saffron, Vanilla will be introduced in Darjeeling and Kalimpong Districts in Phase-II.
- **Other Horticulture Activities:** In water logged areas of different parts of state Water chest nut, Fox nut are profitable crops and its cultivation will be encouraged to generate income of marginal farmers.
- **Post-harvest management of horticulture produces:** - To increase the self-life of highly perishable horticulture produces and for value addition of the fruits, vegetables and flowers all types of post – harvest management practices will be encouraged to generate income of marginal farmers.
- **Innovative horticulture activities:** - Any proposal of innovative horticulture activities will be supported to generate income of WUA farmers.

7.12.4 Climate Resilient Vegetable Cultivation Program

The project will scale up phase 1 experience of raising healthy seedlings under relatively controlled weather conditions in pluck tray using low-cost nurseries. This will help farmers transplant the crops early in the season to the field and market the produce early to get better price.

- **Production Model of low-cost Nursery:** The production model is summarized in Table 7.5.
- **Selection of beneficiaries:** The beneficiaries will be selected using the following criteria.
 - Any women / men those are member of WUA could be a beneficiary under this project if they have minimum 0.125 Ac. homestead land & not more than 2.5 acre of land. It means they should come undersmall & marginal farmers;
 - A group of 2 (or) maximum 4 women / men / mixed (both male & female members) of any WUAs shall be eligible with having homestead land of 500 SQM, for getting the technical support under this program.
 - WUA is the sole authority to select & recommend the list of beneficiaries with due consultation of DPMUteam.
 - They should have some basic knowledge on vegetable cultivation, so that they can easily understood the basic need, practices & regarding crop management issues.
 - They should agree of the policy of WUA assuring their presence, involvement & cultivation of high value vegetable crops for a period of three years minimum for their sustainability with the support of project.
 - If any group fail to manage the green house (or) not utilize the Greenhouse cultivation in future, then WUA have power to hand over the SAME (GREEN HOUSE) to other beneficiaries,

because it is the assets of WUA not of any individual.

2. Table 7.5: Low-Cost Model Nursery for Commercial Vegetable Seedling Production

Area – 50' X 15' = 750 sq. Ft					
No. of Seedling - 40000 (5-6 variety)					
CREATION AND FIRST YEAR MAINTENANCE					
S No.	Item of works	Unit	Quantity	Rate	Total amount
1	Cost of Seed	10gm pack	20	700	14000
2	Cost of Cocopeat	Kg	120	40	4800
3	Cost of Vermicompost	Kg	160	10	1600
4	Cost of Plug tray	No.	800	30	24000
5	Others input cost (Like Trichoderma, Pseudomonas etc.)	LS	LS		1000
6	Cost of Plastic sheet for covering the bed	LS	LS		1500
7	Rose can	No.	1	400	400
8	Battery Operated Sprayer	No.	1	3000	3000
9	Shed Net (Black)	Sqm	100	44	4400
10	Mosquito Net (White)	Sq. ft	1850	3	5550
11	Cost of Shed (with 100mm dia. Bamboo and 200 micron UV protected plastic sheet)	LS			40000
12	Preparation of beds and distributing of Plastic sheet on the bed	MD	Through community participation		
13	Media Preparation and Plug tray fill-in with media	MD			
14	Seed sowing to the Plug Tray	MD			
15	Plug Tray Shifting to the bed	MD			
16	Intercultural operations	MD			
TOTAL					100250

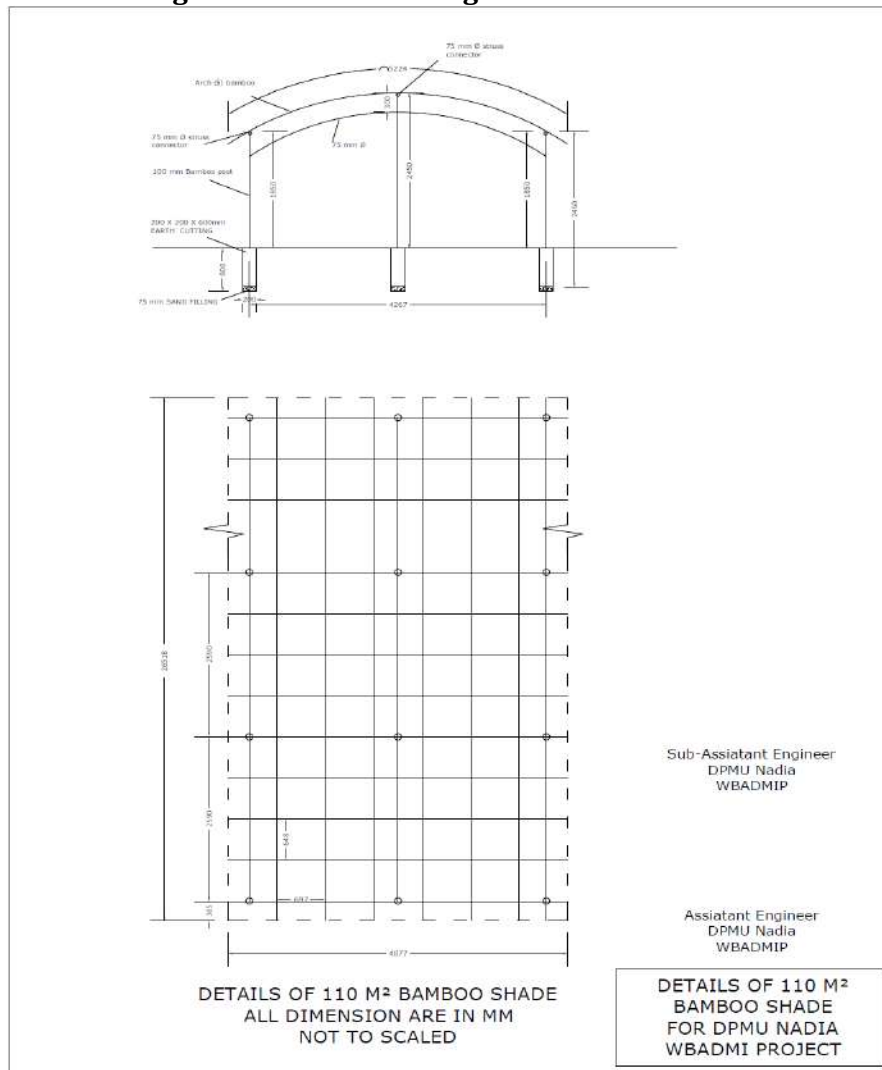
- As a token of taking benefit from the project through WUA the beneficiaries should pay a lump sum amount decide by the WUA “@ Rs.4,000/- (or) @ Rs.8,000/- (or) @ Rs.10,000/- per season” before (or) after each cultivation for avail the Greenhouse benefit as their user’s charges for getting the benefit freely.

Low-Cost Poly Shed: To avoid effect of frequent natural aberrations cultivation of high valued vegetables in low-cost poly shed is very profitable livelihood activity. Early production of vegetables and flowers will be able to fetch extra prices to the farmers of WUA as well as crop will be protected from monsoon rain and other natural calamities within the Poly shed. The production model is summarized in Table 7.6

Table 7.6: Cost Estimate for Constructing Bamboo Shade (110 Sq. Mtr)

Sl. No.	Ref.	Description	Unit	Quantity	Rate	Amount
1	S.O.R PWD 2017 VOL-I, Page No.-01 item No.-02	Earth work in excavation of foundation trenches or drains, in all sorts of soil (including mixed soil but excluding laterite or sandstone) including removing, spreading, or stacking the spoils within a lead of 75 m. as directed. The item includes necessary trimming the sides of trenches, levelling, dressing and ramming the bottom, bailing out water as required complete. (a) Depth of excavation not exceeding 1,500 mm. 33 X (0.2 X 0.2 X 0.6) = 0.792	% Cum	0.792	11927.00	94.46
2	S.O.R PWD 2017 VOL-I, Page No.-2 item No.-4	Earth work in filling in foundation trenches or plinth by silver sands in layers not exceeding 150 mm as directed and consolidating the same by through saturation with water, ramming complete including the cost of supply of sand. (Payment to be made on the basis of measurement of finished quantity of work) In Foundation= 0.2x0.2x0.075x33=0.099	%Cum	0.099	65571.00	64.92
3	Rate analysis enclosed	Ordinary Cement Concrete (mix 1:2:4) Pakur Variety In foundation= (0.2x0.2x0.6x33) - (22/28 x0.1x0.1x33) = 0.434	Cu. M.	0.4340	5146.34	2233.51
4	S.O.R PWD 2017 VOL-I, Page No.-214 item No.-2	Strong bamboo posts, posts plates, rafters, ties etc. fitted and fixed complete with coir rope or nails as directed. (Embedded portion of posts shall also be paid for against this item cost of digging hole and repacking being paid for separately): (a) 75 mm. dia bamboo Post Connector (26.52x3) + Arch (1/4) Bamboo (5.224x45) + Arch Connector (1/4) (26.52x8) + Tie arch (4.57 x 11) + Bracing (1/2) Bamboo (5.5x20) Total = 296.64 (b) 100 mm. dia bamboo For vertical Post = (3.06x11 + 2.46x22) = 87.78	Meter <			

Figure 7.3: Detailed Diagram and Plan of Bamboo Shade (Nadia District)



7.12.5 Poly house for High Value Vegetables

The project will provide intensive training and practical guidance to farmers with technical guidance provided by WUA.

- **Criteria for selection of beneficiary:** (i) Shall be a member of WUA with a minimum of 0.125 Ac of homestead land and not more than 2.5 Ac of land. (ii) A group of (up to a maximum of 4) men, women or mixed having homestead land of 500 sq. m is also eligible. (iii) Shall have experience in vegetable cultivation.

- **Key Rules for Support:** (i) Agreement with WUA to continue cultivation of high value vegetables for a period not less than three years. (ii) Agreeing to pay a lumpsum as decided by the WUA as greenhouse benefit. (iii) When a group set up the poly house WUA will coordinate its smooth functioning. (iv) The land for setting up poly house shall be in the command area of an irrigation scheme with water availability for vegetable cultivation and availability of electricity to run the water pump.

- **Model Design and Estimates:** The model design and estimates for setting up and running poly houses have been prepared by SPMU which will be made available to WUAs.

- **Crops under Agreement & Contract Rate:**

1. Colour Capsicum Rs.110.00/kg
2. English Cucumber Rs.28.00/kg
3. Cherry Tomato Rs.120.00/kg
4. Snaky Pepper Rs.150.00/kg

Similarly, project has decided to start tie-up marketing arrangement of vegetables from playhouses with Sufal Bangla, a Govt. of West Bengal's marketing organization and other marketing agencies. Again, project is trying to utilize services of Farmer Producer Company (FPC) in respect marketing and others.

- **Advantages of the contract:** 100% Buy Back thereby minimizing wastage. Transportation cost borne by the buyer, technical guidance by the buyer to the seller, no middleman, timely payment to the farmers.

- **Advantages of Poly house for vegetables with Drip irrigation system experienced during 1st Phase:**

- The yield was 3-5 times higher than that of outdoor cultivation depending upon, type of crop, environmental control facilities
- Reliability of crop increased under poly house cultivation.
- Ideally suited for vegetables crops.
- Off-season production of vegetable was done.
- Quality of the vegetable fetched good market value.
- Efficient utilization of major nutrients, micronutrients & pesticides were possible to control pest and diseases easily.
- Water requirement of crops were very limited and easy to control.
- Labour component reduced to 60% compare to traditional practices.
- Manual labour and drudgery are reduced (Easy for women).
- Overall operating costs were less.
- Growth rates and crop yield were enhanced.
- Increased farm productivity of participating farmers and an annual income generation of more than Rs.2, 00,000 to Rs.3, 50,000/- per 500sq.m of cultivation area was possible.
- Livelihood options increased to participant families (>2 options per family).
- Scope of wider and easier access to finance for setting up village-based enterprises is created.
- Now better realization of price of farm products through post-harvest management, value addition and market linkages are achieved.

- **Initiatives for capacity building and training:** The key to the success of this project is intensive training and practical guidance. The project implementation began with a baseline survey on existing markets, existing cropping patterns, practices followed by spot feasibility report, soil analysis report, water analysis report and a skill survey of selected participants from each WUAs. With the support of DDH, DHO the experienced professionals provided training on high value vegetable, fruit & flower cultivation, practices on seed selection, crop rotation, integrated nutrient management (INM), integrated water management (IWM) and integrated pest management (IPM) etc for wide scale

implementation of the project. The entire improved agriculture component linked to the Water Resource Management activity so that the main constraint of water for crops is to be addressed.

- **Types of training and workshops:**

- Introduction of new technology, project objectives & goal.
- Concept sharing regarding naturally ventilated green house.
- Impact of high value vegetable crop under control environmental considering the present demand of vegetable.
- Investment, outcome, contribution for the programme.
- Techniques of land preparation, bed preparation & basal application.
- Crop Planning & Rotation.
- Irrigation system – operations & maintenance.
- Fertilizer and Nutrition management.
- Integrated Pest Management.
- Post-Harvest management.

- **Support services:** All types of inputs such as “seed, fertilizers, pesticides, tools & equipments provided to the WUA by ADMI project.

- **Crop Management and Monitoring:** Field visits have been performed regularly to monitor crop health, agronomy practices and advisory support on irrigation, fertigation and pest management provided to each individual farmer on a weekly basis by Agriculture specialist & DPMU team with the support of DHO.

- Assistance provided by DPMU team to ensure smooth availability of seed, fertilizers, pesticides and other crop related information with consultation of farmers.
- Based on proximity all the farmers attended training periodically so that efficacy of training is maintained across every member.
- All data computerized and periodic analysis report generated & collected from DPMU on regular basis as per MIS.

- **Operational Part of Poly house:** The SO & DPMU team facilitated WUA to identifying potential interested beneficiaries from command area & they have got sufficient exposure to horticulture activities to manage the Poly house for cultivation of high valued crop in off season. As per the design the actual area under each Green house was 500 SQM (0.125 Ac.) of land with a plot size of “34-meter length & 15 meter width “showed good result and profit earning than the sizes measuring 200 and 100 sq. m.

- **Selection of Land for Poly house:** While selecting the land for construction for greenhouse the following points were considered taking into consideration for the optimum utilization of green house:

- The land belongs to any one of the beneficiaries under the command area of any WUA no compensation was paid for that. Water User Association is now responsible for coordination with the members who donated land within the command area to do the activity.
- The land record of the beneficiary was properly verified by the WUA members & also by the DPMU team before finalization of spot.
- The areas have assured irrigation facilities & good quality water for cultivation of vegetables, flowers and facility of electricity to run the water pump.

- **Marketing Support:** Support organization and DPMU team along with the interested farmer(s) discussed with the members of WUA and analysed the demand and choose of vegetable for market linkages.
- **Record keeping:** The WUA is maintaining separate records, accounts book for this purpose. Their responsibilities are related with greenhouse management, production, marketing, purchasing of inputs / output details of any crop cultivate under the green house & sharing of profit and activities within the command area, with the help of SO & DPMU team time to time for proper monitoring & follow up the activities. Considering experiences of performances of High-Tech Poly house in 1st phase minimum areas of Poly house should not be less than 500 sq.m. for vegetables.
- **Details proposed estimate cost requirements for the project:** (I) Estimated cost for Design & supply, Installation, Testing and Commissioning of High-tech poly green house is given in Table no. 7.7:

Table 7.7: Cost Details of Hi-tech Poly Green House

Sl. No.	Specification	Area of Shed (M ²)	Quantity	Rate in (Rs.)	Amount in (Rs.)
1	High tech poly house (including Fabrication, Installation and Transportation) Details in Attachment 7.1.	500	1	1275.00	6,37500.00

- **List of vegetables and flowers under Protected cultivation:** Name of Vegetables: Capsicum, Red Cabbage, Broccoli, lettuce, China Cabbage, Tomato, Celery & Zucchini etc. (h) Seed cost (LS) Grand Total budget (Lump sum) = Rs.20,000/- Tentative estimated cost of FERTIGATION & NUTRIENTS COST for High value Vegetable Crops:
 Fertigation expenditure (Lump sum) = Rs.15,000/- (Depending open types of vegetables, varieties & seasons, Vermicompost, Biofertilizers, 19:19:19, 12:61:00, 46:00:00, MgSo₄, CaNo₃, FeSo₄, ZnSo₄, Micronutrients, Hormone & pesticides etc. (5) Post Harvest expenditure: Supply of Crates for vegetable supply & marketing. Lump sum @ 10 Crates minimum @ Rs.700/- per crate = Rs.7000.00
 Hence Overall Grand Total Investment / one-unit Green House in 500 SQM will be Rs. 6,795,00/- per Green House (One unit = 500 SQM).

The details of construction and installation of polyhouses details of setting up micro irrigation system are given in attachment 7.1.

7.12.6 Demonstration Centers (DC) for Vegetable Cultivation

The objective is to demonstrate application of some technological inputs that bring about qualitative change from conventional mode of cultivation. The DCs will organize farmers field day for disseminating the results of the demonstration for adoption among farmers. The technological inputs to be demonstrated are:

- Use of vermicompost as base fertilizer.
- Use of mulching (poly) for controlling weed and reducing evaporation.
- Use of tensiometer for better water measurement.
- Use of IPM techniques like bird percher.

- **Demonstration Model:** The model for demonstration is summarized in Table 7.12. The establishment and first year maintenance of demonstration in an area of 1 Bigha of land is given in Table 7.8 and 7.9.

Table 7.8: Demonstration Model

Area of land	Total estimated cost	Material used	No. of seedlings	Expected income
	Beneficiary contribution	Base manure-FYM & vermicompost	Vegetable in all three-crop season	
	Project contribution	Poly mulch-tensiometer		
	10% profit to be contributed to WUA			
	10% income has to be paid to the WUA			

Table 7.9: Cost of Establishment and Maintenance of Demonstration Unit of one Bigha Area

Sl. No.	Item of works	Unit	Quantity	Rate (Rs.)	Total amount (Rs.)
1	Land Preparation	MD	Through community participation		
2	Cost of FYM	kg	Provided by Community		
3	Cost of Vermicompost	Kg	1000	15	15000
4	N:P:K 19:19:19	kg	1	100	100
5	Chilated Zinc	kg	0.2	1500	300
6	Boron	kg	0.4	900	360
7	Trichoderma	kg	0.6	160	96
8	Pseudomonas	kg	0.6	160	96
9	Bio fertilizer				
a	Azotobacter	kg	0.2	120	24
b	Phosphate Solubilizing Bacteria	kg	0.2	120	24
c	Potash Solubilizing Bacteria	kg	0.2	120	24
10	Poly Mulch	Role	2	2500	5000
11	Crop Guard	No.	20	25	500
12	Seedling	No.	4000	1	4000
13	Fencing	Community contribution			
TOTAL					25524

Selection of WUA: Grade A WUA will be selected for DC. WUA will select preferably a women SHG or a progressive farmer for running DC. If an SHG is selected then it has to lease land and the lessor has to be given annual rent equivalent for a percentage of the income. The SHG or the farmer has to give 10% of total income during all the three seasons to the WUA.

- **Selection of Farmer:** While selecting farmers on whose land demonstration will be organized, the following aspects are to be taken care off. A progressive farmer (preferably a small or marginal farmer) from among the WUA who owns land in the command area and has the capability and resources to follow the instructions provided by the experts in a timely and complete manner will be selected for demonstration. He should also agree to disseminate the demonstrated technologies to fellow farmers in the tank village(s) and the adjoining villages. He must provide labor for carrying

out all operations for preparation of land, completion of complete package practices (sowing, fertilizer application, water management, pest and weed management, etc) up to harvesting of the crop in a timely manner. The selected farmer must agree to use all the inputs provided by the project (like seed, fertilizer, IPM, etc.) for the demonstration plot only, and should neither sell these nor divert their use on his other land. In case of self-pollinated crop demonstrations, he should agree to sell/exchange the seed produced from the demonstration plot to other farmers in the village/adjoining villages on the terms decided by the project staff and WUA. This may include the prevalent rate in the village plus small additional amount in view of the good quality of the variety. He should agree to grow a small control plot by following the farmer's practice in the area. This is required for comparison of results with the improved package of practices followed in the demonstration plot. Different farmers should be selected for different demonstrations, ensuring that the project benefits do not go only to a few farmers.

- **Site Selection:** Area for demonstration plot should be 0.4 Acre. The plot selected for the demonstration should preferably be on the road side and should be easily accessible. This is necessary for organizing trainings and field days at the demonstration site as well as for showing the benefits to the farmers who pass by the demonstration site. The soil type of the plot should be representative of the area. The plot should be levelled and should have access to irrigation facilities. The land should be in the head, middle and tail regions of the irrigation channel. Since on an average four demonstrations are to be organized in each tank, at least one demonstration should be organized in each of these three regions.

- **Methodology:** The project staff should guide the WUA in ensuring that the above criteria are followed while selecting the farmer for organizing the demonstration. The wider village community should be informed about the name of the farmer selected for organizing the demonstration, and it should be done at least two months before the sowing time so that there is adequate time to complete the preparatory work, including the completion of soil test report. All off-farm inputs (like seed, fertilizer, etc.) should be procured well in advance and delivered at the demonstration site about two weeks before the sowing time. If the demonstration involves development of any farm structures and use of pipes, micro-irrigation structures, etc. these should be procured and installed well in advance so that sowing of the crop is not delayed due to delay in completion of these works.

- **Steps in Implementing DC:** Steps to be followed in organizing the demonstration: Though the specific details will be determined by the nature of the demonstration and will vary from one demonstration to another, the following steps should be given adequate attention for organizing good field crop demonstrations.

- **Step 1: Communication:** The larger tank community should be informed that the demonstration is being organized to disseminate improved technologies and practices to a large number of farmers in the village so that they are able to adopt them in the following years and increase their productivity and income.

- **Step 2: Deciding the Treatment:** The treatments in the demonstration should be kept simple – one small control plot showing farmers' prevalent practice for growing that particular crop, fodder, vegetable, etc in the area, and the rest of the plot should have the complete integrated crop management technology including improved seed, recommended fertilizer dose, irrigation/rainwater management, weed control, pest management, etc. Special attention should be given to include critical inputs and management practices which have high payoff but are generally not used by the farmers in the area.

- **Step 3: Training:** 3-4 training sessions should be organized at the demonstration site probably around the sowing time and other stages of the crop to educate the farmers about all the critical inputs and practices which are to be followed for obtaining the highest yield. These trainings should be given wide publicity in advance to ensure that large numbers of farmers participate. Simple brochures or handouts (in local language) listing key practices and operations should be distributed to all the participating farmers.

- **Step 4: Implementations:** Special attention should be given to ensure proper plant population since one of the main reasons for low productivity in the tank command areas is poor plant population. Soil of the demonstration plot should be tested well in advance so that soil test based application of fertilizers is done. All operations in the demonstration plot should be done at the optimum stage of the crop to obtain optimum yield. All other precautions and steps should be taken so as to demonstrate that the crop in the demonstration plot is visibly much better than the farmer's practice control. At maturity, the crop should be harvested and the yield of the control plot compared with the demonstration plot for quantifying increase in productivity and additional income obtained as a result of adoption of the improved technology demonstrated. A display board should be installed in each demonstration plot.

• **Field Days:** As part of the demonstration a field day will be organized with the objective of using the on-farm demonstrations for disseminating improved technologies to large number of farmers in the command area villages. As seeing is believing, the field day organized at the site of each demonstration will show the benefits of adopting the improved technologies to the farmers. The salient points to be followed for organizing field day are:

- Field day should be done at a stage when marked differences in crop condition and expected yield between the demonstration plot and the control plot are clearly visible.
- Normally the appropriate time for organizing the field day is shortly before the harvesting of the crop.
- The date of the field day should be decided well in advance and this should be given wide publicity in the village and adjoining villages.
- Invite staff from the concerned line departments like agriculture, horticulture and animal husbandry.
- Organize large number of farmers to attend the field day.
- On the field day the farmers should be shown the control and demonstration plots and encouraged to discuss the likely benefits from the demonstrated technologies.
- A training session should be organized by the project staff to educate the farmers about what has been done in the demonstration plot which is different from the practice normally followed by them; when was it done, how and why; what are the likely benefits; etc. Relevant brochures and handouts should also be distributed to the farmers on the field day. Special attention should be given to educate the farmers about the critical inputs, operations and practices which they should follow to obtain highest productivity levels. In addition to short lectures covering specific aspects, farmers should give free time to ask questions so that it is more of an interactive and question answer session rather than a lecture by an expert.
- Encourage farmers to adopt the demonstrated technologies on their farms in the next crop season, where from they can obtain various inputs like seed, fertilizer, plant protection and weed control materials, how they should carry out all the operations at the optimum stage of the crop, wherefrom they should obtain technical guidance, what are the difficulties they are likely to face in procuring the required inputs and adopting the improved practices, and how these can be addressed.

- Since seed is a critical input and acts as a catalyst in the adoption of other practices, in case of self-pollinated crops some arrangements should be made to distribute the seed of the demonstration plot to other farmers in the village/adjoining villages.
- The date of crop cutting, which will take place sometime after the field day, should be announced in the field day. The farmers should be invited to come on that day so that they can actually see the increase in productivity as a result of adoption of improved technologies demonstrated in the plot.

- **Encouraging Wide Spread Adoption:** In order to encourage large numbers of farmers in the command area villages for adopting the critical demonstrated technologies on their fields in the years following the crop season in which the demonstration is organized, meetings of farmers will be organized in the village before the sowing season of the crop in the following year (s). Technical guidance and support should be provided to enable the farmers to acquire the required inputs by tapping into the ongoing schemes funded by Govt. of India and the GOAP, like Rashtrya Krishi Vikas Yojana, National Food Security Mission, Horticulture Mission, State Extension Reforms scheme, etc. Linkages should also be established with the state line departments of Agriculture and Horticulture, for achieving large scale adoption of the demonstrated technologies by the farmers. Based on the response, an enhanced target for the subsequent years may be fixed.
- **Evaluating Success of DC:** The success of a demonstration should be assessed at two levels – one in terms of how well the demonstration was organized to cover all the above steps and the level of gain in productivity in the demonstration plot vis-à-vis farmer practice in the area; and second in terms of adoption rates of the demonstrated technologies by the farmers in the project villages during the years following the year in which the demonstration was organized and the gains in productivity achieved by the farmers on their fields.

For measuring the adoption rates in the following years, the following three parameters should be monitored:

- Number of farmers adopting new technologies. It is likely that most of the farmers may not adopt all the practices due to various constraints. Efforts should be made to facilitate adoption of critical practices which will result in substantial gains in productivity.
- Area over which the new technologies have been adopted
- Gains in productivity achieved by the farmers

The focus of the demonstrations should be on maximizing these three parameters. The gains in productivity levels achieved by the adopter farmers in most cases will be lower than those achieved in the on-farm demonstration plot per se, but these are an excellent indicator of the real success of on-farm demonstration because these benefits will accrue to large number of farmers (and will not be confined only to the direct beneficiary who received input support from the project) in the project area. These benefits will also be sustainable because the farmers will continue to use these improved practices. This will also substantially increase the number of households benefitting from the project, lower the cost per household, and improve the rate of return to investments under this component. The OK card will be completed and duly signed by all concerned and kept for records.

7.12.7 Polyhouse for Floriculture

The project will scale up floriculture in polyhouse piloted during phase-I. Poly house with hydraulic ramp pump or hydram with prefabricated water silos will be used as source of irrigation. The flower species of gerbera, carnation, chrysanthemum, rose, lotus etc. will be grown. The project is planning

to undertake a thorough review of the ongoing floriculture activities to finalize the program. However, the tentative eligibility and key rules are similar to poly houses for vegetable cultivation.

- **Objectives of the Activity:** The objectives of the activity are:
 - encourage marginal farmers to take up floriculture (100 M²).
- **Districts for Floriculture:** The main districts identified for floriculture activities are summarized in Table 7.10.

Table 7.10: Geographic Costs for Floriculture

Name of District	Focus Areas	Name of Flower
Kalimpong		Gerbera, Orchid, Azalea, Lily, Carnation, Anthurium, Gladiolus etc.
Nadia	Ranaghat	Chrysanthemum, Gerbera, Lily etc.
Howrah	Bagnan	Rose, Chrysanthemum etc
Purba Medinipur	Panskura	Gerbera, Rose, Gladiolus etc

- **Scheme Details:** The technical program will have the following components of activities:
 - Use technology like polyhouse, hydraulic ramp pump or hydram has irrigation;
 - Pre-fabricated water xylose are used for storage of water;
 - Drip irrigation with fogging facilities are provided inside polyhouses for fertigation;
 - Farmers provided with training and exposure visits including hand holding from a service provider on scientific floriculture;
 - Farmers will be provided with buy back contracts for marketing;
 - will be promoted in areas having access to flower markets possessing suitable agro climatic factors.
 - The flower markets of Kolaghat and Panskura will be additional tapped in Purba Medinipur.
- **Package of Practices:** The detailed husbandry practices and costs for taking up floriculture are summarized in Table 7.11.

Table 7.11: Detailed Package of Practices and Costs

Package of practices	Cost(Rs.)	Remarks
Field preparation @rs 500/labour(Total Labour required 11)	5500	
Polyhouse cost (10 years Longevity)	Rs.22370 (Through Project)	Total cost- Rs. 223687/Polyhose
Bed preparation (3 years Longevity)	Rs.22340 (Through Project)	Total cost- Rs. 67024/Polyhose
Seed /Seedling (3years longevity)	Rs.16608 (Through Project)	Total cost- Rs. 49824/Polyhose
Organic Fertilizer cow dung @Rs 50/doko	Rs. 2500	
Irrigation Tank (10 years longevity)	Rs.7760 (Through Project)	Total cost- Rs. 77627/Polyhose
Packaging Materials (10 years longevity)	Rs.8156 (Through Project)	Total cost- Rs. 81561/Polyhose
Labour cost	Rs. 3000	
Total cost of cultivation	Rs. 88234	

- **Average Income from Unit:** Based on experience the average income from a floriculture unit is estimated in Table 7.12.

Table 7.12: Estimates of Income from Floriculture Unit

Total Production (No)(Avg.)	18473nos.
Total Income (Expected) Rs.5.00/Flower	Rs. 93715.00
Net Profit(Expected)	Rs. 5481.00
Total Selling Product	Grade A-8235 Grade B-4329
Average Selling Price (Rs.) per Flower	Grade A- Rs. 5 & Grade B – Rs. 4
Total Income (Rs.) after Selling	Rs. 58491
Net Profit after Selling	Rs. 29743

7.12.8 Open Field Floriculture

The project will promote open field floriculture as an alternative livelihood activity for very marginal farmers having one and half bigha or 2 bighas of land with irrigation facilities. The activity will be taken up in potential districts as detailed in Table 7.13.

Table 7.13: Potential Districts species for Open Field Floriculture

Districts	Geographic Area	Flower Species
Nadia	Ranaghat	Chrysanthemum, Gerbera, Gladiolus, Tube rose etc.
Howrah	Bagnan	Rose, Chrysanthemum, Gerbera, Lotus, Gladiolus etc.
Purba Medinipur	Panskura	Rose, Gladiolus, Gerbera, Lotus etc

These areas have been identified considering experience and potential of farmers having some exposure in floriculture and micro irrigation facilities are available. They are already connected to flower market of Kolkata, Purba Medinipur having another flower market at Kolaghat as well as Panskura. The initiatives already undertaken by farmers will be strengthened by the project.

7.12.9 Mixed Fruit Plantation Development

Mixed fruit plantations which will bear fruits for at least 25 to 30 years will be taken up in cultivable fallow lands and other available lands mainly in Western lateritic districts and coastal districts. In areas with no source of irrigation rain water harvesting and retaining moisture in soil will be the technology adopted.

- **Objectives:** The main objective of this activity is to put the cultivable fallow land available in the districts to effective use for I) Employment generation, II) Generating income for farmer for 25-30 years, III) raise intercropping to grow vegetables, pulses and oil seeds etc. spice crop like ginger, turmeric even when the fruit tree is fully grown.

- **Implementation strategy:** Cultivation of fruit trees include long term / perineal crops which necessitates inclusion of land owners in the cultivation, management and sharing of benefits. In order to avoid future disputes land owners are to be included as members of the WUA with voluntary decisions to cultivate including rules for benefit sharing. The existing land related and tribal related legal requirements will be fully met. SO/SPs map suitable type of land with the help of community workers and get engaged with the land owners. Generally, in case of Paschimanchal districts where such type of land is available in stretches, several hectares of land owned by a no of families are

approached for taking up such activity. They are explained in detail the benefit of this work. It is also emphasized that if the plantation work is taken up in a systematic way it would fetch them handsome return over 25-30 years. From the experience of past few years, it has been seen that initial engagement with the community (land owners) is very crucial. When the community (land owners) agrees to take up the plantation work, the SO/SP and DPMU team make joint visit and assess the feasibility like plant type that may be suitable for the land, preference of the farmers as to plant type which they want to grow, source of irrigation, projects and community's share in the work etc.

Source of Irrigation: In case of Paschimanchal districts since these lands are up land, which generally has slopes there is no source of irrigation. In such cases water conservation structures like zig zag trenches, hapas at the upper reach and WDS in the lower reach are dug to arrest run off which help in retaining moisture over considerable period of time. Since plantation crop do not require as much irrigation as field crops for its survival, these measures, even when monsoon is withdrawn, have been found to be adequate for its sustenance. In case of South Bengal and North Bengal districts irrigation can be sourced from ponds, canals, tube wells etc. In case of Darjeeling district Jhora rejuvenation is done to source irrigation water.

- **Plant type:** Choice of plant type is made based on soil type and agro-climatic zones and district wise plant types are summarized in Table 7.14.

Table 7.14: Plant types for raising Plantations

Agroclimatic Zone	District	Plant type
Northern Hill Zone	Darjeeling	Black pepper, Mandarin orange, large cardamom, avocado, Lemon, mosambi, guava, betel nut, banana, jack fruit, apple, plum
Terai-Teesta Alluvial Zone	Cooch Behar	Papaya, guava, ber, banana, lemon, mango, black pepper, bay leaf, betel nut
	Jalpaiguri	Lemon, black-pepper, jackfruit, betel nut, papaya, banana, ber, mango
	Uttar Dinajpur	Mango, lemon, guava, betel nut, papaya, Drum stick, litchi
Vindhyan Alluvial Zone	Dakshin Dinajpur	Mango, lemon, guava, betel nut, papaya, Drum stick, litchi
	Malda	Mango, banana
Gangetic Alluvial Zone	Bardhaman	Guava, jackfruit, ber, mango
	Howrah	Jack fruit, banana, papaya, mango, drum stick
	Hooghly	Mango, guava, lemon, Malta, banana, papaya
	Murshidabad	Mango, guava, jack fruit, papaya, ber
	North 24 Pargana	Mango, guava, coconut, banana, drum stick, papaya
	Nadia	Guava, banana, litchi, black pepper, mango
Undulating Red and Laterite Zone	Bankura	Mango, cashew, guava, arjun, ber, mosambi, jack fruit, pomegranate, lemon, drum stick, pineapple
	Purulia	Mango, guava, lemon, cashew, mosambi, jack fruit, pineapple, drum stick
	Birbhum	Mango, lemon, mosambi, jack fruit, pomegranate, guava, cashew, pineapple
	West Medinipur	Cashew, arjun, lemon, jack fruit, mango, papaya, drum stick, pineapple
Coastal Saline Zone	South 24 Pargana	Coconut, carancha, drum stick, pineapple, banana, sapota, betel nut, mango
	East Medinipur	Mango, lemon, guava, coconut, betel nut, sapota, banana

- **Mode of execution:** After the DPMU short list the plots of lands and it engages with the community owning the land and application is made jointly by land owners to the Executive Engineer, DPMU expressing their intention to take up plantation activity on their land. Then the SO/SP initiate steps for formation of WUA, its registration under W.B Society Registration Act 1961, opening of bank a/c, making pan card etc. In the meantime, DPMUs prepare the DPR and send it to SPMU for according administrative approval and financial sanction. DPR is based on soil type, terrain type, plant type availability of irrigation, water conservation structure to be created etc. In many places there may be bushy growth on this land which are also required to be cleaned before actual ground work starts. The technical details of the plantation based on crop and variety are summarized in Table 7.15.

Table 7.15: Technical details of Tree Plantation Development

Name of the crop	Variety	Spacing (Mt.)	Pit size (Ft.)	Total plant/Ha.	FYM/ plant (Kg)	Vermi/ plant (Kg)	Neem/ plant (Kg)
Mango Himsagar	Him Sagar	8x8	3x3x3	158	10	5	2
Mango (Others)	Amrapali, Mallika, Thai Hybrid, Katimon	5x5	3x3x4	400	10	5	2
Dragon fruit	Bari Dragon I	2.5x3	2x2x2	1361	10	2.5	1
Mosambi	Nagpur	4x4	1.5x1.5x1.5	625	3	2.5	1
Malta	Blood red	4x5	1.5x1.5x1.5	625	3	2.5	1
Cashew	V4,V3,BPP8, Balavadra	6x6	3x3x3	278	5	5	2
Large cardamom	Local	2x2	1x1x1	2500	3	2.5	1
Guava	Baruipur,L49	5x5	2x2x2	400	5	5	2
Arjun	Local	3x3	1.5x1.5x1.5	1100	3	2.5	1
Pomegranate	Bhagwa	4x4	1.5x1.5x1.5	625	5	2.5	1
Lemon	Kagzi, Pati, Seed less	4x4	1.5x1.5x1.5	625	3	2.5	1
Ber	BAU	4x4	1.5x1.5x1.6	626	5	2.5	1
Banana	G9,Bagda Kanthali, Malbhog	2x2	1.5x1.5x1.5	2500	3	2.5	1
Papaya	Red lady	2x2	1.5x1.5x1.6	2500	3	2.5	1
Black pepper	Paniur	2x2	1x1x1	2500	3	2.5	1
Orange	Darjeeling	5x5	2x2x2	400	3	2.5	1
Drum stick	PKM 2, ODC	3x3	1x1x1	1100	3	2.5	1
Betelnut	Hirehalli,Thirtahalli	3x3	2x2x2	1100	5	5	2

Avocado	West Indian race/Guatemalan race/Mexican Race	5x5	2x2x2	400	5	5	2
Litchi	Muzaffarpur	5x5	2x2x2	400	5	5	2
Coconut	Malayalan green dwarf, Chowghat orange	7.5x7.5	3x3x3	180	10	5	2
Jack fruit	Baromasi	4x4	2x2x2	625	2	5	2
Sapota	Kalapati	4x4	2x2x2	625	2	5	2
Date palm	Samran/Medjal	6x6	3x3x3	272	10	5	2

- **Procurement of saplings:** Based on report sent by DPMUs, compilation is made at the SPMU end for total requirement of saplings, vermicompost and neem cake etc. for the entire state and tender is invited for its procurement. For saplings, some major nurseries are visited by SPMU team and quality of saplings assessed its specification fixed and the list of nurseries is shortlisted, and the list of nurseries is sent to WUAs for inviting quotation and placing order. In case of FYM farmers are to make the supply from local source for which they are paid @ Rs.2.00/kg.

- **Execution of work:** - Upon issuance of administrative approval and financial sanction, Executive Engineer, DPMU initiates steps for execution of work. Generally eligible WUAs are awarded the work. The entire plantations work is divided into 3 phases.

1. Ground clearing.
2. Pit digging according to approved DPR specifications along with trench cutting and hapa digging.
3. 2-3 weeks after pit digging is over, pit filling is done with FYM, vermicompost and neem cake towards the month of June-July. Pit digging, trench cutting and other earth works are done either as per MGNREG's schedule by engaging WUA members or with the help of machines as per WRID&D schedule. Pit filling, manure application, planting of saplings etc. are done manually as per approved DPR.

Planting of saplings is completed positively by September, before the withdrawal of monsoon. It ensures greater survivability of saplings. Even if monsoon withdraws by October, residual moisture helps in survivability of saplings and eventual rooting.

- **Post plantation care:** It involves a) staking of saplings with bamboo stick. b) Intercultural operation c) watering if needed where source of irrigation is there d) spraying with bio-pesticides if needed etc.

All these operations are done with man-days provided by WUA as per approved DPR from the month of November-May.

- **Intercropping:** Since fruit tree plants take 4-5 years for bearing fruits, it is of utmost importance to see that intercropping is taken up in the space between two rows for generating income for the farmer. It is done in the ensuing Rabi season itself. A lump sum amount of Rs. 25000/- is given to the WUA for the purpose of intercropping including the cost of seed, fertilizer and pesticides etc. Pulses, oil seeds, seasonal vegetables, spices like turmeric, ginger etc. are grown as intercropping. From the

reports available for plantation crops in phase-I it has been seen that farmers earn a healthy income from intercropping averaging Rs. 25000-30000/- per Hac.

- **Plantation management:** Plantation is required to be taken up as a full-fledged economic activity since it may fetch handsome return for the farmers over the years. To achieve the goal farmers are required to be trained of plantation management for proper tending of this plants, like manuring, application of pesticides irrigating etc. so that plants bear optimal yield.
- **Post harvest management:** At the same time farmers are also required to be trained in post-harvest management practices so that shelf life of the fruits is enhanced and it fetches good prices at the market. Promotion of good WUA/cluster as FPC that will act as aggregator for the harvested fruits of different WUAs so that farmers may get a good price for their produce.

7.12.10 Promoting Farm Machinery and Implements

The activity will be scaled up based on experience from phase 1 with a view to reduce cost of production. The activity will help completion of operations on time, reduces labour cost, reduces drudgery and improve profitability. The various types of farm machinery and implements to be promoted are summarized in table 7.16.

Table 7.16: Farm Machinery and Implements

Name of Implements	Purpose
1. Mini Power Tiller-Cum-Weeder Max-power-7.00 H.P	Land preparation, weeding, turning soil and row preparation, power take off for water pump and sprayer and other attachment etc.
2. Power Tiller Max-power-14 H.P Diesel operated	Cultivation of land and weed removed from fallow land, power take off for water pump, thresher and sprayer and carrying argil produces.
3. Bush Cutter Power output 1.8 H.P Displacement-30.8 M ³	Cleaning of weeds and grasses from fallow land.
4. Mist Blower Container capacity -13 ltd. Horizontal spraying range-12mts.	Spraying of water in fog forms to treat humid conditions in a confined condition.
5. Foot Sprayer Brassgun,23 mtr. pipe	To spray agri inputs like insecticides, micro nutrients, liquid fertilizers etc. to the plantation crops i.e., Mango orchard, Coconut plants etc.
6. Knapsack Sprayer Capacity-16 ltd	It is hand operated sprayer to spray agril like insecticides, micro-nutrients, liquid fertilizers, growth hormones, weedicides etc to field crops and vegetables and fallow lands.
7. Secateur Single edge	It is used for pruning of branches of plants for propagation, removal of undesired plant shoots, diseased parts of tree etc.

- **Operational framework:** The farm machineries so far delivered are used by farmer members of WUA against some hiring charges. WUA maintain machinery registers to keep track of hiring as well as keep accounts of charges so realized. The hiring charges so collected is utilized to purchase fuel as well as meet maintenance and repairing cost. When the machinery is hired by anyone outside WUA then they charge higher rates from them. In case of Purulia and Cooch Behar districts WUAs have constructed Machinery Ghars for safe keeping of the machineries from their own corpus. Other districts have been asked to follow this model.

7.12.11 Low-Cost models of Vermi Compost

Individual farmers will be trained on production of Vermi Compost using low-cost models of vermin pit. The details of vermicompost production program are summarized in Table 7.17.

Table 7.17: Vermi Compost Program details

Model No.	Size	Type of pit	Estimated cost of pit preparation (Rs.)	Annual production (kg)	Net income (Rs)/year
1	2mx1mx0.15m	Brick wall covered with polythene sheet	1600.00	625.00	7500.00
2	2mx1mx0.15m	Fully Brick work	2739.00	625.00	7500.00
3	2mx1mx0.15m	Single pucca pit with vermin wash collection chamber	4172.00	625.00	7500.00
4	2mx1mx0.15m	Double Pucca pit with common partition wall having pucca drain	6072.00	1250.00	15000.00
5	2mx1mx0.15m	Pucca double chambered with common partition wall having CPVC drain	6930.00	1250.00	15000.00
6	8x2.45mx0.91mx0.31m	Combined Vermicompost pit (8 units) each of 2.45mx0.91mx0.31m	55869.00	6000.00	72000.00

7.12.12 Bee Keeping

Realizing the potential of providing supplementary income to large number of rural, hilly and tribal population the project will promote bee keeping. Being the best pollinator bee keeping has the potential to increase yield of mustard by 49 percent, sunflower by 48 percent and fruit trees by 44 percent bee keeping will be a boon to crop production in addition to income from honey.

- **Objectives:** Objective is to support farmers in producing and marketing honey and honey products. The month-wise plan source of nectar and pollen in different districts of the state are summarized in Table 7.18.

Table 7.18: Sources of Nectar and Pollan

Name	Time of Flowering	Source of Nectar or Pollen
Eucalyptus	Nov-Dec	Nectar
Acacia	Sep- Dec	Pollen
Drum Stick	Feb- March	Nectar & Pollen
Mango & Litchi	Feb-March	Nectar & Pollen
Neem	April-May	Nectar
Jamun	May-June	Nectar
Coconut	July-Aug	Pollen
Lemon	April-May	Nectar
Tamarind	July-Aug	Nectar
Dart	April-May	Pollen
Kadambo	June-August	Pollen
Mustard	Nov-January	Nectar & Pollen
Coriander	Feb-March	Nectar & Pollen
Black Seed	Feb-March	Nectar & Pollen
Sunflower	March-April	Nectar & Pollen
Sesame	April -May	Nectar & Pollen

Better Gourd	August- October	Pollen
Cylinder Gourd	June- August	Nectar
Chilly	January-December	Pollen
Gourd	January- December	Pollen
Cucumber	July- October	Nectar

- **Model Business Plan:** A farmer by keeping 5-6 boxes of honey bees in his farm can have a business plan of investment and income shown in Table 7.19. There is very little time and labour required for raising the bee species *Apis cerena indica* which is a local strain with high resistance against diseases and nectar sources.

Table 7.19: Model Business Plan for Bee Species *Apis Cerena Indica*

Investment				Income			
Apparatus	Quantity Pcs.	Rate Rs.	Amount Rs.	Production	Quantity	Rate Rs.	Amount Rs.
Bee Box	5	900.00	4500.00	Honey	40Kg.	180.00	7200.00
Bee Colony	5	800.00	4000.00	Wax	2.5Kg.	250.00	625.00
Smoker	1	150.00	150.00	Bee -Colony	15Pcs.	800.00	12000.00
Face veil	1	100.00	100.00				
Honey extractor	1	700.00	700.00				
Knife	1	50.00	50.00				
Recurring Capital	One year		1000.00				
Total Expenditure			10500.00	Total Income			19825.00
				Total Expenditure			10500.00
				Profit in one year			9325.00

- **Bee Keeping Program:** The project will provide the following inputs:
 - Provision of bee boxes and bee colony;
 - Developing master trainers;
 - Hand-holding of farmers through experienced external institution;
 - Tribal women SHGs and marginal farmers will be the focus of the activity;
 - The focus districts and program activities are summarized in Table 7.20.

Table 7.20: Focus Districts for Honey Bee Keeping

Sl. No.	Name of District	Nos. of bee-box to be distributed	Nos. of farmers to be trained
1	Purulia	30	30
2	Bankura	30	30
3	Jhargram	30	30
4	Birbhum	30	30
5	Malda	30	30
6	Murshidabad	30	30
7	Nadia	30	30
8	North 24 Parganas	30	30
9	South 24 Parganas	30	30
10	Howrah	30	30

11	Hooghly	30	30
12	Bardhaman	30	30
13	Paschim Midnapur	30	30
14	Purba Midnapur	30	30
	Total	420	420

- **Developing Master Trainers:** The project will support identification of master trainers to support bee keeping farmers. The roles of the master trainers are:
 - To provide training to bee-keepers of his locality as and when required.
 - Will help in selection of suitable sites for bee-keeping.
 - To help bee-keepers in day-to-day management of bee-boxes i.e., pest and disease problems, feeding etc.
 - To help in extraction, wax, royal jelly, venom, nectar and preservation of honey.
 - Multiplication of boxes as well as bee colony.
 - To assist bee-keepers in marketing.
- **Marketing Support:** Project will tie-up with the Vivekananda Institute of Biotechnology (VIB), Nimpith, South 24 Parganas in respect of marketing of honey, wax, nectar and royal jelly produced by bee-keepers of WUAs of districts. VIB is agreed to procure unprocessed honey and other bee products produced by the WUAs of different districts.

7.12.13 Sericulture

The project identified Tasar cultivation in Western laterite districts particularly Bankura, Jhargram and Purulia. The activity will be promoted among Tribal dominated WUA members. The phase-I of the project already created Arjun plantation of more than 50 ha.s in these districts for Tasar cultivation. This year 2022-23 rearing has been taken up for the first time. Project procured DFLs and gave it to farmers of Bankura district for the first time and farmers earned an income of Rs.34322.00/ha. In phase –II more areas are targeted for Tasar cultivation.

7.12.14 Seed corm Production of Elephant-foot Yam

Elephant Foot Yam is a highly remunerative vegetable and can easily be grown in plain land in West Bengal. As it is non-perishable vegetable can be stored few months and transported long distance market and play good role in livelihood generation. As there is a huge shortage of good quality seeds in West Bengal and farmers will purchase Elephant Yam seeds with high cost which are marketed from Andhra Pradesh mainly. Pest and disease problems are negligible. Farmers of WUA can be benefited both from seed production and production of main crop.

Mode of activities: - Farmers will be supplied with Tissue culture seedlings from Vivekananda Institute of Biotechnology, Nimpith, South 24 Parganas after 3rd hardening of seedling for open field cultivation. And produced materials will be utilized as seed materials for next year cultivation.

7.12.15 Fruit Crops Nursery

Availability of quality planting material is a prerequisite to the success of horticulture development initiatives. The requirement of planting materials of fruits, coconut, cashew, black paper, Mango etc. have great demand within and outside the WUAs. There are several constraints in the existing system of plant propagation. There are several private nurseries operating in the State playing important role in multiplication of planting material of horticulture crops and many of them follow traditional methods and lack adequate infrastructure and sell plant material of unknown pedigree. Of many other constraints, un-availability of standardized root stocks and non- maintenance of healthy stocks

of elite varieties are worth mentioning. Advantages of establishment of Fruit plants nursery at WUA level a) Seedlings and grafts are produced in nursery from which the fruit orchards can be established with minimum care, cost and maintenance b) The nursery planting materials are available at the beginning of the planting season. This saves the time, money and efforts of the farmers to raise seedlings c) There is a wide scope for fruit orchards, ornamental, vegetable, and landscape gardens at WUA level. d) It assures the production of genetically improved quality planting material. e) It provides employment opportunities for technical, skilled, semi-skilled, unskilled labor. f) They are an important source supplying the seedlings for meeting the, fruits and other demands of the industries. Initially Fruit plant nursery of Mango, Cashew and Mandarin Orange will be established at WUA level. In 1st phase a Mango nursery has been established by tribal woman farmers at Asatore WUA , Hirbadnd Block of Bankura district.

The cost of establishing one unit of mango nursery with a capacity of 20,000 saplings/year will come to Rs. 33,15,538. The project will contribute Rs. 9,84,349 while community contribution will amount to Rs. 23,31,000. The summary cost is in Table 7.21 and details are in Attachment 7.21.

Table 7.21: Summary of Mango Nursery Cost (Amrapali and Himsagar) (INR)

Sl. No	Cost Item	Total Cost	Project Share	Community Contribution
1.	Cost of Nursery Infrastructure and irrigation system	5,73,750	5,29,750	44,0000
2.	Material Cost	13,65,970	2,23,742	11,42,228
3.	Cost of Small Implements and Consumables	1,62,912	35,390	1,27,522
4.	Cost of Labor	11,76,172	1,87,135	9,09,037
5.	Cost of Bed Preparation and Fencing	36,734	8,332	28,402
	Total Cost	33,15,538	9,84,349	23,31,189

7.12.16 Spices Cultivation

Spices cultivation is another area under Horticulture with huge scope for meeting demand in market. Large Cardamom Ginger in Darjeeling and Kalimpong, Black pepper, Bay leaf and Cinnamon etc. is suitable for other North Bengal districts while Turmeric, Garlic, Onion, Coriander, Fenugreek, Funnel etc. suitable for South Bengal. Another two spices like Saffron, Vanilla may be introduced in Darjeeling and Kalimpong districts.

For this WUA/SHG mapping has completed identifying farmers having land and the DPMU putting in place timely action in this regard.

7.12.17 Other Horticulture activities: -

Project has identified few water-logged areas at different marginal areas where Water Chestnut and Fox nut may be grown as a profitable enterprise of marginal farmers. Similarly in the same areas lotus may be considered as a livelihood generation activity.

Other site-specific remunerative horticulture activities like cultivation of medicinal plants, condiments including processing, packaging etc. may be considered

7.12.18 Village Industries

In Paschimanchal districts as well as in Jalpaiguri and Alipurduar districts there are vast areas under forest. From these forest, local people, mostly tribals, collect non timber minor forest produce like sal leaves, babooi grass, lac, honey etc. These tribal people have very small parcels of land which cannot provide them employment all the year round. So, if they may be provided some livelihood generating activities in home based industrial activity like sal plate making with the help of pressing machine or lac-based activities then it helps them earning additional income for some period of the year.

For promoting village industries, the project will undertake:

- Construction of a Common Facility Centre (CFC) for a WUA –the centre would be used for installation of machine, for storage of raw leaves, keeping plate etc;
- An electrically operated press machine to be procured from khadi board;
- For these activities some fund for Rs. 50 lakh- Rs.75 lakh may be kept annually and with this fund a lot of activities may be supported in a year in these priority districts.

7.13 Training and Capacity Building

- **Exposure Visits:** As part of capacity building the project propose to organize Exposure Visits to selected farmers of WUA to learn directly from other farmers and institutions who have successfully implemented proposed interventions. The project plans to arrange 1080 numbers of intrastate exposure visit (among adjacent districts). Each district of exposure visit will have about 20 farmers (total 1080 farmers) and the visit for one day. The project may also conduct 3 out of state visits with each group consisting of 30 farmers (total 270 farmers). These exposure visits will be made to learn about water management and farming practices adopted in other States that have a potential to be introduced in West Bengal.
- **Staff Capacity Building:** The project proposes to provide orientation to project staff, SO staff and DPMU staff on successful conduct of demonstrations and FFS. Trainings for the line department staff will be conducted at the departmental training institutes or other state level training institutes. Resource persons of specific field from Agricultural Universities and other State and National Agriculture Institutes of repute will be hired for giving these training. The training program and training module etc. will be developed by the SPMU in collaboration with State Nodal Officers of the line department. The training of SO and DPMU staff will be carried out by the SPMU agriculture expert and resource persons from among the trained line department staff. These trainings will be carried preferably in the service area of the respective staffs, mainly at the district or cluster of district level.
- **End of Season Workshops:** At the end of each crop season, comprehensive Workshops are being planned for the five agro-climatic zones. These workshops will be conducted to review the performance of crop demonstration and FFS, fact sheets, results of adaptive trials conducted in that agro-climatic zone. Each workshop will have about 40-50 numbers of participants, including select lead farmers from each district, line department staff, SPMU, DPMU and SO staff and Agriculture University experts etc. The workshop will allow sharing of information and cross learning amongst the district teams from an agro-climatic zone facilitating improvement in the crop demonstration program for the subsequent years.

7.14 Main outcomes

The key outcomes from the sub component are: (i) extend of irrigated area brought under high value horticulture crops; (ii) number of farmers benefitting from post-harvest handling and direct access to market with improved price realization.

7.15 Sub Component C.3: Inland Fisheries (Aqua culture) Production

The sub component is to provide alternate livelihood to landless and marginal farmers by providing opportunities for inland fish production in tanks, ponds and other inland water bodies. The project focuses development of irrigation services through surface water harvesting leading to extended water holding in storage structures which provide excellent opportunity for inland fishery development to cater to the vast domestic market within the state and local markets.

7.15.1 Experience from Phase I

During phase I members of WUA formed Fisheries Interest Groups (FIG) and FIG of farmers having water bodies for fish culture. The FIGs were given demonstration centers or mass production scheme for inculcating scientific methods of fish farming to build their theoretical knowledge and provided hands of training. Support from the project included in addition to training and demonstration, supply of inputs like fingerlings, fishfeeds etc. Fingerlings production was taken up by women SHGs as a profitable and popular economic activity.

7.15.2 Critical Constraints

The phase I implementation revealed main constraints affecting the fisheries as a livelihood activity for farmers suffer from the following main constraints.

- Lack of certified hatcheries producing quality seeds especially of indigenous species; and
- Lack of access to good quality feed in the market which constitute 60 percent of the fish culture cost.

7.15.3 Objectives of the sub-component

The objective of the sub-component will be:

- To fully harness the water bodies created under the Project; and
- To promote pisciculture as a livelihood activity among FIG consisting of a few interested members of the WUA.
- To popularize culture of indigenous fish species.

7.15.4 Scope of the Sub-component

The sub-component will be implemented in 23 districts of the states covering a total area of around 3,100 ha. of water spread area. The focus of the sub-component is to promote fishery activity in the project villages both within and outside the command area of MI schemes. The sub-component will promote integrated organic fish farming utilizing and biologically treating organic wastes and enabling eco-restoration. The dyke of the WDS, small Hapa, ponds, excavated water bodies etc. will be used for fish culture. The sub-component will focus the culture of indigenous species of West Bengal which are well known for their nutritional value thereby conserving the species. The scope of the sub-component is summarized in Table 7.22.

Table 7.22: Scope of Fisheries Sub-component

Agro-Climatic zone	District	No. Of excavated WDS	Avg. Area (ha)
Northern Hill Zone	Part of Darjeeling	1047 nos. Happa	0.005
	Jalpaiguri	Nil	Nil
Teesta Tarai Alluvial Zone	Cooch Behar		
	Part of Darjeeling		
	Jalpaiguri		
	U.Dinajpur		
Gangetic Alluvial Zone (Lower Gangetic Plain region)	Murshidabad	12	0.6
	D.Dinajpur	26	0.4
	Malda	41	0.8
	Nadia	37	0.2
	Part of U. Dinajpur	Nil	Nil
	North-24-Pgs		
	South 24 Parganas	31	3.2

	Howrah	42	0.2
	Hooghly	1	0.4
	Birbhum	Nil	1.0
Red & lateritic region	Purulia	615	0.4
	Part of Burdwan	9	0.8
	Birbhum	12	1.0
	Bankura	322	0.5
	Jhargram	550	0.1
	Paschim Medinipur	253	0.7
	Part of Murshidabad	7	0.6
Vindhyan Alluvial Zone	Howrah	Nil	
	Hooghly	17	0.4
	Burdwan	Nil	Nil
	Birbhum		
	Bankura		
	Paschim Medinipur	76	0.7
	Purba Medinipur	100	1.0
Coastal Saline Zone	Part of N-24-Pgs	59	1.2
	Part of South-24-Pgs	158	3.2
	Howrah	38	0.2
	Purba Medinipur	347	1.0
Total nos. of WDS		2753	

In case at North Bengal Districts (Dakshin Dinajpur, Uttar Dinajpur, Jalpaiguri, Alipurduar, Cooch Behar, Darjeeling) where WDS created under the Project are negligible, water bodies under the personal ownership of WUA members may be taken on lease by WUA/ FIG. In case of South-24-Pgs. and North-24-Pgs. dist., the canals/ creeks (avg. length 3.5 Km., Width 12-15 meter, and depth 3 meter) excavated by the Project offers huge scopes for fishery at least 8 months of the year when standing water is adequate to support this activity without compromising the requirement of water for agro-horticulture activities.

In case of S-24-Pgs district, large nos. of canals has been excavated also under Jala tirtha/ RIDF scheme outside of the Project. If these water bodies are put to good use through cultivation of various models that are may create huge employment generation in sustainable manners over the years. This is more so because the district is adjacent to Howrah-Kolkata urban belt with good communication with good market linkage together with other infrastructure like ice plant, electricity etc. Moreover, the women SHG's within the WUA's may be specially engaged for pisciculture as they have sufficient corpus of their own for mobilisation of fund for these activities.

7.15.5 Activities to be financed

The sub-component will implement the following activities:

- (i) Formation and strengthening of FIG through SO/SP;
- (ii) Fish farming demonstrations & mass production;
- (iii) Provision of inputs, tools and implements;
- (iv) Capacity building of farmers including training, exposure visits etc.;
- (v) Community based seed production;
- (vi) Community based feed production;
- (vii) Provision of lead fish farmers;
- (viii) Integrated fish farming;
- (ix) Cold water fisheries in hilly areas;
- (x) Scampi seed and juvenile production;

- (xi) Community based Carp fingerlings production;
- (xii) Community based Bhetki fry to fingerling production;
- (xiii) Disease diagnostics and treatment
- (xiv) Soil & water testing laboratory construction
- (xv) Capacity building of implementing staff; and
- (xvi) Fish based value-added product development and marketing.

• **Formation and strengthening of FIG:** Since WUA is the owner of the water body then the FIG can take the waterbody on lease for minimum period of 3 years on lease rent to be fixed by the WUA. This WUA ownership will ensure a fixed tenure for the FIG since the farmers who were initiated to the scientific method of farming can be exposure of a minimum 3 year to acquire skills fully.

For the initial year of the Project, project support will be in the form of:

- Field Level training
- Support of test kit with demonstration of how to assess water and soil quality and other parameters.
- Supply of quality fry/fingerlings.
- Supply of quality fish feed (HACCP & BAP certified) – 70% of the total input cost for the first year of farming 50 % and 30% in the second and third year respectively in order to inculcate the habit of supplementary feeding and rest to be met from feed produced from locally available materials.
- Supply of fishing net- Since regular netting is very much an important part of the farming activity it has to be supplied to FIGs/WUAs for once.
- Exposure visit- Exposure visit to the light house WUA, helping in clustering of FIGs and helping them in market linkage and also visit to the fish hatchery, farms, etc.

The district-wise number of FIG proposed to be formed under the sub-component are in Table 7.23.

Table 7.23: District-wise Proposed FIG nos. in Second Phase

Sl. No	Name of District	Proposed FIG nos.
1	Purulia	350
2	Bankura	350
3	Nadia	120
4	South 24 pgs.	300
5	Paschim Medinipur	200
6	Jhargram	200
7	Malda	100
8	Jalpaiguri & Alipurduar	350
9	Dakshin Dinajpur	150
10	Uttar Dinajpur	150
11	Birbhum	200
12	Cooch Behar	200
13	Burdwan	100
14	Darjeeling	100
15	Purba Medinipur	250
16	Howrah	150
17	Murshidabad	100
18	North 24 Pgs.	200
19	Kalimpong	100
20	Hooghly	100
Total		3770

- **Fish Farming Demonstrations and Mass Production** : The sub-component will be implementing fish farming demonstrations as summarized in table 7.24

Table 7.24: Details of Fish farming

Sl. No	Fisheries Scheme Name	Type of Activity	Duration of Culture (In month)	Unit Area (Ha)	Project Support/ Unit area Approx. (Rs.)	FIG's Support/ Unit Area Approx. (Rs.)
1	Spawn to Fingerling	Demonstration	3-4	0.26	42550.00	43250.00
2	Breeding of Fresh water Giant Prawn		1-2	0.10	16805.00	8730.00
3	Post larvae to juvenile of Fresh water Giant Prawn		1.5-2	0.10	57600.00	17600.00
4	Fry to Fingerling of Carp fish		1.5-2	0.065	12975.00	9945.00
	Bhetki Fry to fingerlings production		2	0.065	36560.00	4600.00
5	Small nutritional fish with carp culture	Mass Production	6	0.5	37050.00	18050.00
6	Polyculture of Deshi Magur/ Singhi with Carp		6	0.065	24725.00	3700.00
7	GIFT/All male / Monosex Tilapia Culture		6	1	143150.00	30800.00
8	Only Chital Culture	Demonstration / Mass Production	9	1	118900.00	22300.00
9	Only Bhetki Culture		9	1	156000.00	23700.00
10	Fresh Water Giant Prawn with selected IMC	Mass Production	6	1	157800.00	23800.00
11	Pangus Monoculture		6	1	159725.00	50800.00
12	Deshi Magur, Singhi, Koi and Tangra Culture		6	0.13	28600.00	9950.00
13	Singhi Monoculture		6	0.13	52200.00	7950.00
14	Koi Polyculture		4-5	0.13	52500.00	11950.00
15	Pabda Polyculture		6	0.26	50525.00	7400.00
16	Murrel Farming (Shoal)	Demonstration	9	0.13	59,600.00	11700.00
17	Box-Based Crab Fattening		1	0.13	196,851.00	5600.00
18	WDS/SFMIS/WHT based Carp Culture	Demonstration/ Mass Production	6	1	201150.00	40050.00
19	WDS/SFMIS/WHT based Pangus fish Culture		6	1	278,150.00	62050.00
20	WDS/SFMIS/WHT based GIFT/All male / Monosex Tilapia Culture		6	1	255,550.00	34050.00
21	CD (Running natural aquatic system) based IMC fish Culture		6	1	153500.00	11500.00
22	Market based approach of Carp fish for any feasible closed water area	Mass Production	6	1	112650.00	42050.00
23	Multiple Stocking & Multiple Harvesting of IMC fish		12 (for 2 cycle in a year)	1	228150.00	52300.00
24	Small cage-based fish culture		6	1 nos. of cage	3,850.00	550.00
25	Fishery cum Horticulture integrated program (Specially embankment area of WDS/SFMIS/ WHT and Check Dam)		6	0.52	7000.00	21575.00
26	Hill area intervention with geothermal liner on GIFT/ All Tilapia/Monosex Tilapia & Carp fish culture		6	One single hapa (75 mtr. ³)	23833.20	950.00
27	Hill area intervention with geothermal liner on Polyculture of Mahseer fish		9		24245.70	950.00
28	Hill area intervention through Natural Pond on Carp fish culture		6		5380.00	950.00

29	Ornamental fish farming (Molly, Platy, Sword tail- All kind of Live Bearer group), Gold fish (Proposed Activity)	Demonstration	3	0.13	35000.00	15000.00
30	Duck cum Fish Farming (Proposed Activity)		6	1	270000.00	70000.00
31	Raceway based Trout Farming		8	68 m3	500000.00	50000.00

Project Contribution and FIG support will be changed in every financial year, depending on price of input materials.

- **Community based seed production:** Regions specific 20 small scale carp hatchery will be constructed in different district of West Bengal which will boost to make available the quality spawn to the WUA farmers.

There is some organised cluster in South Bengal districts where quality spawn is available but in case of North Bengal districts quality spawn is in insufficient supply. Fish hatcheries will be given to the SHG's within WUA/ FIG within WUA who have undertaken pisciculture activities for 2-3 years and sufficient corpus of their own to finance the working capital for the hatchery and the Project intervention will be limited to the fixed capital.

Moreover, the WUA/SHG has to gift the land for the setting up of the Hatchery either by making simple deed or on lease. Then the WUA or the SHG has to not only have their sufficient fund by their own and they may have to going for bank loan if required. The model for the hatcheries is given in Annexure 7.3.

- **Catfish are considered to be high value species** in West Bengal. Catfish are hardy in nature and they have the ability to stand longer time without water. They have the ability to grow even in poor environmental condition. *Clarias batrachus* / *Heteropneustes fossilis* / *Mystus* sp. / *Anabas* sp. normally called as cat fish in India has greater value and high demand in India due to its therapeutic value. There are great chances to culture in shallow type pond which are found in rural Bengal, but there are less availability of good quality cat fish seeds in W.B. So, to enhance the seed production, it is suggested to establish of **Deshi Magur Hatchery** in our project villages including preservation of indigenous germplasm. The model for the hatcheries is given in Annexure 7.4.

- **Community Fish Feed Production:** The sub-component will for the purpose of bridging the gap between the demand and supply of fish feed will establish small to medium scale fish feed mill units/plants in every DPMU for the production of supplementary fish feed. SHGs and WUAs will be involved to source locally available ingredients for feed production. Based on demand districts will be identified for setting up of mini to medium plants. Fish feed certified as **HACCP** will be promoted and distributed through FIG for demonstration purpose. At the farmer level motorized pelletizer machines will be promoted. The number of fish feed mills to be promoted under the sub-component is summarized in Table 7.25. The model for the fish feed is given in Annexure 7.5.

Table 7.25: Number of Fish Feed Mills to be promoted

Sl. No.	DPMU's Name	Nos. of Fish Feed Mill	Approx. Project Cost (Rs. in Lakh)/ Unit Feed mill
1	South-24-Pgs.	3-4	10
2	Purba Medinipur	2-3	
3	North-24-Pgs	1-2	
4	Purulia	2-3	
5	Bankura	2-3	
6	Jhargram	1-2	
7	Cooch Behar	1-2	
8	Alipurduar	1-2	
9	Uttar Dinajpur	1	
10	Dakshin Dinajpur	1-2	

11	Malda	1-2	
12	Jalpaiguri	1-2	
13	Birbhum	1-2	
14	Nadia	1	
15	Burdwan	1	
16	Paschim Medinipur	1-2	

- **Soil & water testing Facility Center:** The fish farming scheme have been started since the beginning of the WBADMI Project in newly excavated water bodies without measuring water and soil quality of the water body. Even in several seed production units of the project, the fishermen didn't receive proper water and soil testing facilities initially, which leads to a lower survivability rate of the spawn. Keeping that in mind, now in the second phase, different kinds of essential water and soil test kits are being provided to all the hatcheries and seed production units under supervision of this project. After all, there is a need to start a low cost soil and water test lab facility within the Water User association or in CWUA. In the Coastal region mangrove cum fisheries schemes is another new initiative where assessment of water and soil quality is very important to enable long-term fish farming in a sustainable manner. Beside these, farmers will be trained more about pond water and soil quality management, as well as they will be sensitized about the use of lime, organic/inorganic fertilizers, probiotics etc. The following water and soil quality should be test in periodic manner
 1. Soil & Water pH 2. Alkalinity 3. Hardness 4. Plankton Density 5. Ammonia 6. Salinity 7. Dissolve Oxygen 8. Organic Carbon for proper execution of fisheries scheme.

- **Integrated Fish Farming:** The project will promote paddy cum fishery and poultry cum fishery units. [Specify how many in each category, unit cost and project support, criteria for beneficiary selection, role of WUA, role of beneficiary and other guidelines].

Duck cum Fish Culture – In western lateritic districts large nos. of WDS has been constructed in Phase –I & more nos will be constructed in Phase-II. In South 24 Pgs. about 600 km of canal have been excavated in the Phase- I as well as Govt. sponsored schemes. These Canals have created a huge water area to support duckery as a part integrated fish farming & duck rearing. Duckery will be entirely women/SHG based activity. The birds will be procured by WUA/Women group from their own corpus fund or convergence with Govt. dept. programme.

The Project support will be in the form of:

- Imparting hands-on training with the help of ARD dept. (with the help of Pranimitra/ Pranibandhu;
- Provide full extension with the help of regular visits to the Group with the help of Pranimitra/ Pranibandhu who is engaged by the Project. They are also providing vaccination, medicine as prescribed by experts.
- Providing quality feed, vitamins and minerals in first six months. Subsequently, these will be procured by the group themselves.

- **Promoting Lead Fish Farmers:** The project will identify and build capacity of lead fish farmers as ToT and technical service provider.

Criteria for selection

- He/ She shall be a member of the WUA as well as FIG.
- He/ She shall preferably be class VIII pass.
- He/ She is having experience in fish farming activity of minimum 2 years.

The number and category of lead farmers is summarized in Table 7.26

Table 7.26: District Wise Lead Farmers Information

Districts	Category no.
Purulia, Bankura, Paschim Medinipur, Jhargram, Birbhum, South-24-Pgs.	3-4 LFF in each category
Purba Medinipur, North-24-Pgs., Nadia	2-3 LFF in each category
Hooghly, Howrah, Murshidabad	2-3 LFF in each category
Malda, Dakshin Dinajpur, Jalpaiguri, Alipurduar, Cooch Behar	2-3 LFF in each category
Darjeeling & Kalimpong	2 LFF in each category

As a result, when the Project will withdraw itself, the community have developed resource person which is now bridged by the experts of the project/ SO, SP.

Farmers were engaged in different activities both Fishery for at least 2-3 years under the Project and it's also qualified enough (8th Pass / More).

To understand the basic science of the subject and has the capacity to communicate to his fellow farmers effectively.

He/ She will be disposed to attend the residential training for theoretical and practical knowledge to be provided by the Project.

He/ She will be disposed to impart training to the farmers as on when it is required by the WUA's under the Project.

Assistance from the Project:

- Residential training for 3-4 days with hands on demonstration.
- Printed study materials.
- Testing kits if required
- Certification to be issued by Project Director.

Rules of Engagement:

- Engagement will be made by the Executive Engineer, DPMU zone wise in a district.
- DPMU will engage them for training of FIG members / fish farmers in that zone.
- Fees & Remuneration
- Rs. 700/- per day for 3 hrs. including cost of travelling.

• **Cold Water Fisheries in Hilly areas:** Darjeeling district is full of rivers, canals and jhoras. Rivers like Mechi, Balason and Teesta represent the major rivers of this district. Darjeeling is thickly interspersed with innumerable hill streams, some of which are potential sources of fish supply.

This activity will be implemented in hilly areas of Darjeeling and Kalimpong. The project will provide fingerlings of grass carp, common carp and some indigenous fish species (Mahseer). This sub-component will set up cold water fish hatchery by involving interested fishermen. Small scale fish feed mill and storage facilities will be set up. Training, demonstrations, provision of lead farmers will be supported.

Chocolate mahseer (*Neolissochilus hexagonolepis*) is a highly esteemed food and game fish, and is considered as a threatened species and hence needs special attention to conserve for increasing its population in the natural water bodies. (IUCN 2016). Chocolate mahseer is a batch spawner. With good brood stock management, hatching and rearing practices, mass scale seed production of chocolate mahseer is possible round the year which in turn will help in conservation and aquaculture practices in hilly region. Setting up of a low-cost community based Mahseer hatchery in the Kalimpong district, with proper technical guidance and training has already been established. A first-time marketing of Mahseer fry of approximately 4000 pieces was successfully executed from the same hatchery.

All the species of mahseer & trout are amenable to hypophysation, egg taking and artificial fertilization. At least 10 feasible size hatcheries are required at Kalimpong district and efforts may be made to breed mahseer/trout species on a large scale. Once the mahseer/trout seed is available poor people of this region and fish farmers can use fry and fingerlings for Hapa ranching, raceway ponds and running water culture. The model for the Mahseer hatchery is given in Annexure 7.6.

Trout Rearing Unit: In order to utilize the cold water resource, number of fast growing and economically viable species have been introduced, which include species of Carp and Trout. The Rainbow Trout (*Oncorhynchus mykiss*) is a temperate region (cold water) carnivorous fish species which needs crystal clear and highly oxygenated water, thus well suited for water systems of Himalayan states. Rainbow Trout farming has great potential in India since Trout is one of the high value species and having high demand in both domestic and international market. Trout farming is commonly being undertaken in the neighboring state of Sikkim due to the suitable temperature range (5° C to 18° C). The Himalayan region of Darjeeling hills in the state of West Bengal has similar altitude and climatic conditions (temperature ranges) that has been found to be suitable for trout farming. The region has ample cold water resources and is suitable for the culture of high value cold water fish like trout.

A Raceway model is given in Annexure 7.7

• **Scampi seed and juvenile production:** This activity will be promoted in brackish water project villages of South and North 24 Parganas and Purba Medinipur. For breeding of Scampi salinity to the level at 10-12 ppt is required, for that reason there is huge scope for scampi breeding. Generally, the PL is collected in estuarine Sundarbans area which impacts the biodiversity of riverine belt. So, Scampi breeding through scientific process helps in development of juvenile very effectively considering the natural habitat. There is a huge gap in supply chain since high demand of quality scampi juveniles in the market.

During this year, a pilot project is launched at South 24 Pgs. & Purba Medinipur district on scampi breeding and rearing that produced 35 lakh nos. PL and 22 lakh nos. juvenile which were sold at market on an average @ Rs. 5 / pc of juvenile within 60-70 days. While piloting the scheme, the women group should tremendous enthusiasm as they were giving hands on training and demonstration at the field. There is investment is having a water body min. size of 1000 m² either owned/ lease. Lease rent will be paid by group. These water bodies must have access to saline water.

Since there is a huge demand at the market, it is a seller's market, the group did not face hurdle in marketing these juveniles. Since this is a very seasonal activity the group has taken up cultivation of Prawn during the rest of the year, giving them a secondary income. Scampi breeding as well as rearing provides a wholesome engagement to the groups throughout the year. The year-wise program is summarized in Table 7.27.

Table 7.27 Year-wise Scampi Breeding and Rearing Unit Details

Unit	Year	Activity	Purba Medinipur	South 24 Pgs.	North 24 Pgs.	Howrah	Paschim Medinipur	Nadia	Total
Scampi Units (Nos)	2024-25	Breeding	7	20	3				30
		Rearing	16	40	8	1	2	1	68
	2025-26	Breeding	7	20	3				30
		Rearing	18	40	8	2	2	2	72
	2026-27	Breeding	5	10	5				20
		Rearing	18	45	13	2	2	2	82
	2027-28	Breeding	5	10	5				20
		Rearing	18	43	15		2	2	80

Scampi Breeding Unit Cost (in lakh INR)	Project Share	4.03	10.08	2.69				16.8
	FIG Share	2.1	5.24	1.4				8.74
Scampi Rearing Unit Cost (In lakh INR)	Project Share	40.32	96.77	25.34	2.9	4.7	4.1	174.13
	FIG Share	12.44	29.84	7.81	0.88	1.43	1.24	53.64

- **Community based Fingerling Production:** In the state of West Bengal, the adoption of Carp fingerlings/ advanced fingerlings at grow out pond is not a regular subject because of unavailability of quality fingerlings in village areas throughout the year. This cause overstocking and slow growth of fish and ultimately it hampers in production chain. It has been shown that, inoculation of Carp fingerlings/ advanced fingerlings, is the first steps for scientific practice. During last 4 years women FIG in different district produced quality fingerlings from quality spawn, breed from certified hatcheries which meet up the fingerlings demand of WUA fishers.

Production of quality fingerlings all around the year.

- Ensuring brooders quality
- Seasonal activity duration 3 month
- Women FIG/SHG shows tremendous resilience for raising the fingerlings
- Creating their own market

- **Community based Bhetki fry to fingerling production:** Asian seabass (*Lates calcarifer*) is an important candidate finfish species for farming and grows rapidly up to 1.2 to 1.5 kg size within a culture period of 12 months in freshwater and brackish water environments. It is a carnivorous fish and highly cannibalistic in nature and attack the smaller size fishes leading to low survival rate in the farming systems. Hence, stocking of uniform size fingerlings in the cage or pond based culture systems and periodic grading is essential to get better growth and survival. In West Bengal, there is a high demand for Bhetki fingerling as Bhetki fish are considered is high value fish here. But the availability of **uniform size sufficient quantity** of good quality fingerlings throughout the year is the main challenges. In order to meet this deficiency, South-24-Parganas, North-24- Parganas and Purba Medinipur, and also in other districts Bhetki fry will be reared to fingerlings size involving the women FIG/SHG/FPG is the best way. Certified Hatchery produced (both for Brakishwater & Fresh Water), Bhetki fry should be used for production of Bhetki fingerlings. This rearing program provides a wholesome engagement to the groups throughout the year.

- **Disease diagnosis and treatment:** Use of antibiotics is completely prohibited in fisheries activities. Whenever required, CAA (Coastal Aquaculture Authority) approved medicines will be used. Collaboration with existing organization i.e., West Bengal University of Animal and Fishery Sciences may be may be utilised by the Project.

An SOP for monitoring and checking of disease in aquaculture sector will be introduced. Regular awareness camps on the disease diagnosis and treatment are to be organized. ITK based medicine should apply to control disease in rural areas.

- **Fish based value-added Product Development and Marketing:**

Value addition is the most talked about word in food processing industry, particularly in export-oriented fish processing industry because of the increased valuable foreign exchanges. Value can be added to fish and fishery products according to requirements of different markets. As far as fish processing industry is concerned value addition is one of the possible approaches to raise the profitability. One factor responsible

for such situation is more and more women getting educated and taking up employment. Market surveys, packaging and advertising are a few of very important areas which ultimately determine the successful movement of products. A new appropriate channel would be super market chains which want to procure directly from source of production.

Freezing: The fish portions are air cooled before freezing. This helps the coating temperature to drop while the batter can stabilise itself and recover from the frying shock. Freezing is done at a temperature of -10°C to -20°C in order to preserve freshness and quality of the product over longer storage periods.

Fish Drying: Drying of fish can act as an alternative livelihood in coastal zones of West Bengal i.e. Sundarbans and Purba Medinipur district. This is mainly women centric activity. There are basically two methods of drying fish. The common one is by utilizing the atmospheric conditions like temperature, humidity and airflow. This is traditional sun drying. The other is dehydration or artificial drying, by using artificial means like mechanical driers for removal of moisture from the fish under controlled conditions. Sun drying depends heavily on the natural weather conditions since the fish is dried by heat from the sun and the air current carries the water away. In mechanical driers, removal of water from the fish is achieved by an external input of thermal energy.

- **Capacity Building:** The capacity building activities will include training of beneficiaries on basic awareness, technical training, institutional training, training of lead farmers and training of FIG/SHG on value chain activities and refresher cost for staff members. The capacity building program for FIG is summarized in Table 7.28.

Table 7.28: Capacity Building Program for FIG's

Training Course	Target Stake Holder	No of Participants	Unit Cost (Rs.)	Trainer	Duration	
Formation of FIG and its activities	WUA members	25-30	100/ Person	Fisheries Spl., FFA, Fisheries Expert S.O	1 day	
Criteria for pond selection and Fish Species selection	WUA, FIG, SHG Members	15-20			1 day	
Basic pond preparation	FIG, SHG, Fishers Members	10-15			2 day	
Stocking density and Species composition					2 day	
Manuring& Liming					2 day	
Spawn to Fingerlings					3 day	
Scampi Breeding			100/ Person & Honorarium 1000/Day	Experienced Farmers, Expert from KVK, Research Institute, SAU, Govt. Dept.	5 day	
Scampi Rearing					3 day	
Bhetki Fry Rearing				Fisheries Spl., FFA, Fisheries Expert S.O	2 day	
Water and Soil quality measures			2 day			
Feed Management			1 day			
Harvesting and Marketing				100/ Person	Experienced Farmers	3 day
Disease Management			100/ Person& Honorarium 1000/Day	3 day		
Hatchery Management and Brooder Management, Nursery pond management					30000/ Batch	Expert from KVK, Research Institute, SAU, Govt. Dept.

7.15.6 Criteria for selection of water bodies

The first priority for initiating fisheries activities is in water bodies created by the project like WDS, canal, CD, SFMIS etc. In case of small WDS with one to two bigha of water areas, a cluster of four to five WDS within a radius of 500 meters will be taken up.

The next priority will be collectively owned ponds (private ponds) by WUA members. Government owned ponds are taken on lease for fisheries. Individual private ponds are the last priority and the owner shall be willing to provide the pond on lease.

- **Leasing of Pond:** All privately owned ponds are to be leased in the name of WUA or FIG by the legal owner. In case of public ponds, the Gram panchayats has to execute the lease deed. The lease deed shall be prepared on judicial stamp paper and annexed a mouza map demarcating the pond. The lease period shall be minimum for three years and ideally for seven years. The lease rent for project constructed WDS/WHT will be negotiable between FIG & WUA with an annual increase of 5% to be paid to WUA by the FIG. For private ponds, the fishery team of the DPMU will help undertake an assessment and recommend lease amount.

7.15.7 Fishers Interest Groups (FIG)

WUAs depending upon potential for starting fisheries livelihood, formally endorse formation of FIG. FIGs are informal but functional groups of fish farmers working under the overall coordination and supervision of WUA. About 10 fishers living around water bodies are mobilized into FIG. Any FIG members while mobilizing is from outside WUA membership, the person will be inducted as WUA member.

- **Water Body Considerations:** The number of farmers in the FIG is based on the size of the water body. For water bodies having size more than 1.5-hectare one FIG become feasible. When water bodies are smaller, a cluster of water bodies will be required to sustain a FIG.
- **Number of Members:** The minimum size of FIG shall be 3 to 15 farmers depending upon the water area. In Northern district of Darjeeling, Kalimpong etc. having large number of smaller private ponds, FIG become non-feasible and individual support will be considered.

7.15.8 Fisheries Interest Group – Structure and Functions

The FIG select one president, secretary, treasurer each and two lead fishery farmers as part of their leadership structure. Including them the other members of the FIG form the general body.

- **Responsibilities of FIG:** Take joint decision to monitor & manage overall functionality of this activity. Each member must have participated in this activity and different type of work will be allotted within the group members.
 - Arrange and call meeting at any time for smooth functioning;
 - Two of them selected by FIG members will represent FIG at WUA Governing Body;
 - Take part in other activities during processing cycle;
 - Their responsibility at the end of 1st year fisheries cycle is to confirm to keep input cost as the capital (provided by WBADMIP Scheme cost) for next adoption next year;
 - Distribute profit amount among FIG members;
 - Distribute daily wages amount to the worker;
 - Fixing date of activity (meeting, fisheries work, etc.); and
 - All decisions of the FIG shall be recorded in the resolution book.

- **Criteria for becoming members of FIG:** The criteria for becoming a member of FIG are:
 - (i) Members of WUA who are marginal, economically weaker section, energetic unemployed youth can become FIG members;
 - (ii) Only one individual per family can become members of FIG;
 - (iii) An economically weak person having share on DC pond;
 - (iv) A member of WUA or a person who is willing to offer his/her pond for this activity may also be a member of the FIG provided FIG collectively decides so. But preferably pond owner who has a significant size of pond or who is a member of WUA having significant size share in that particular pond may not be encouraged to be a member of FIG.
 - (v) Priority will be given to women to be a member of FIG who will fulfil the above criteria
 - (vi) 1/3rd of the FIG Member should preferably be women.
 - (vii) In ST villages (ST population percentage will be 40% or above) percentage of ST, beneficiaries should be 60%, president and secretary of the particular FIG will be ST.
 - (viii) Any member belonging to fishermen community and willing to work in a team will be given preference.

7.15.9 Financial Management

The FIG shall maintain income-expenditure record, stock registers and carry out its activities transparently. The main financial considerations are:

- (i) 10% of the net income shall be shared with WUA;
- (ii) The net income shall be calculated from the records maintained by the treasurer, secretary and president of the FIG which shall be presented and approved by the general body of members;
- (iii) The profit generated net of WUA contribution shall be shared among FIG members as approved by the general body;
- (iv) Financial support to the FIG including materials shall be through WUA, 50% of which can be paid in advance and balance only when fish become ready for harvest.

- **Rules of Business:** The FIGs shall conduct their affairs following:
 - (i) All decisions related to pisciculture like pond preparation, fingerling and fish feed transportation, use of culture materials like feed, lime, net, sale of fish, sharing of profit, etc. should be taken at the meeting of FIG. At this meeting majority opinion shall be accepted. The quorum for the meeting shall be 60% (out of the total number of 10 members, six shall be present and voted).
 - (ii) During taking decisions on future fisheries plan, taking water body on lease, amount of lease rent, investment, type of cultivation to be taken, mode of funding, etc. decisions by majority shall be taken;
 - (iii) Similarly, for including as a new member in a FIG, removal of a member from FIG, etc. 2/3 majority's decision shall be held good; and
 - (iv) If FIG fails to resolve the problems, difference among them then the matter shall be placed before the Executive Committee of the WUA whose decisions shall be final and to be accepted by the FIG.

7.15.10 Implementation Steps

The steps, detailed tasks, milestones and responsibilities for implementing the sub-component is summarized in table 7.29.

Table 7.29: Implementation Process steps for Fisheries Sub-component

Sl. No.	Main Activity	Important Tasks	Main Responsibility	Expected Duration	Deliverables
1	Selection of Water body	Extensive Field Visit during lean period	CW, Fisheries Expert SO, FFA	2 months	Physical Verification

2	Formation and Strengthening of FIG	Meeting with WUA members	CW, Fisheries Expert SO, FFA, Fisheries Spl.	1 month	Physical Meeting/ On-line mode
3	Aqua-culture planning including selection of species	Field visit, Training, Input Distribution	Fisheries Expert SO, FFA, Fisheries Spl.	1 month	
4	Capacity Building	Different Type of training		4 months	
5	Aqua Culture Production including profit sharing	Meeting with FIG members		1 month	

7.15.11 Capacity Building Framework

The sub-component will implement various training programs a summarized in Table 7.30.

Table 7.30: Capacity Building for Fisheries sub-component

Type	Course	Training Venue	Trainees	Trainer	Duration
General /Basic course	Basic fishery, various technology, pathogens & remedies, post-harvest technology	DPMU	Community worker of supporting organization	Dept. fisheries officer, fisheries Spl., Farm expert, Fisheries NGO, Leading Company	1day
Cluster level course	Implementing technological session	SPMU	FFA/Fisheries Specialist/ Expert	Fisheries Coordinator/State Fishery Dept.	2days
FIG level course	Every session of the Adoption technology	village	Members of the FIG	FFA and EXPERT	6-9months
Community level course for awareness	Essence of Fish farming	Project Village/ Nearby locality	New fisheries interest person/existing fishers	FFA/EXPERT	1 day
General /Basic course	Basic fishery, various technology, pathogens & remedies, post-harvest technology	DPMU	Community worker of supporting organization	Dept. fisheries officer, fisheries Spl., Farm expert, Fisheries NGO, Leading Company	1day
Institutional course	Specific advance technology	Research institute, SAU/abroad	Selected FIG by DPMU, field level Officers, Lead Farmers	Professor/Scientist /Lecturer of research Institute or SAU/KVK	Weekly/2 Week

- **Exposure visits:** Exposure visits will be organized for the benefits of (i) Project staff; and (ii) Beneficiaries.

For Project Staff: In order to provide exposure to Project staff (Specialist, FFA, Expert, CW) on advanced technologies in the field of fisheries management covering culture technologies, best harvesting practices, health management, post-harvest, marketing, policies and socio-economic aspects, the project will organize training cum exposure visits of ICAR Institute, SAU, KVK, Farm, etc in West Bengal as well as outside of the State;

For Beneficiaries: Exposure visit for fisher's is much needed program for better understanding of knowledge. Group members will visit different successful scheme under another group, these process leads to better understanding on application of technology. Besides, fishers will visit to Farm, KVK, ICAR Institute to participate training cum exposure visit program at regular interval (twice in a year).

- **Training Calendar:** The capacity building activities will follow the seasonality of fisheries production and the training calendar is in table 7.31.

Table 7.31: Training Calendar on Fisheries Sub component

Subject	Month	Held At
Quality Carp fingerlings Production	March-May	Village Level
Fish based Integrated Farming	May-August	Farm & Village
Cat fish seed production and Culture	March-August	Hatchery & Village
Use of Organic manure	May- Nov.	Village
Fish Feed Production using Local Resources	Jan-June	Cluster Level
Periodic Water Quality Monitoring	Throughout the Yr.	Village
Local Indigenous fish culture	May-Nov.	
Scampi Seed Production and Culture	Feb- May	
Control Tilapia Farming	May-Feb.	
Feather back Culture	June-Feb.	
Lates fingerlings production and Culture	Mar-Feb.	
Murrel Culture	June-Jan.	
Basic Knowledge on MSMH of Carp fish	Throughout the Yr.	
ITK in Fish Health Monitoring, Water quality assurance	Throughout the Yr.	
Fish net mending and maintenance	Oct.-Feb.	Cluster Level
Tools and implement in fisheries	Throughout the Yr.	Village
Good Management Practices in Aquaculture		Cluster Level

- **Facilitating Mass adoption of Technology:** In order to encourage large numbers of farmers in the project villages for adopting the technologies on their water body in the years following the fisheries scheme is started. A village level meeting of fisher's will be organized in the village before the release of the fingerlings in the selected water body. Technical guidance and support should be provided to enable the farmers from the project. Therefore, line dept. and other govt. organization linkages should also be established with the FIG, for achieving large scale adoption of the successful schemes by the farmers. Based on the response, an enhanced target for the subsequent years will be fixed.

7.15.12 Monitoring Sub component Activities

The success of a schemes should be assessed at two levels – one in terms of how well the schemes was organized to cover all the above steps and the level of gain in productivity in the schemes and second in terms of adoption rates of the technologies by the farmers in the project villages during the years following the year in which the schemes was organized and the gains in productivity achieved by the fishers on their water bodies.

For measuring the adoption rates in the following years, the following three parameters should be monitored:

- (i) Number of farmers adopting new technologies (optimum stocking, pond preparation, manuring, liming, supplementary fish feed use, etc). It is likely that most of the farmers may not adopt all the practices due to various constraints. Efforts should be made to facilitate adoption of critical practices which will result in substantial gains in productivity (like maintain optimum stocking, optimum liming, use of farm made feeding, manuring, size of the seedlings, etc.);
- (ii) Area over which the new technologies have been adopted;
- (iii) Gains in productivity achieved by the farmers; and
- (iv) At the end of the culture period, the harvesting data and other data must collect in O.K card format as per positive consent of the beneficiaries.

7.15.13 Applicable rates for ASS activities

Rates will be approved by the Project Director for every financial year and accordingly the cost emirates may be modified.

8. COMPONENT-D: PROJECT MANAGEMENT

The Project Management Component is aimed at further strengthening DWRID to spearhead project implementation at all levels. In addition to achieving an efficient project management and coordinating mechanism, the focus of the component will be also on strategic strengthening and policy reforms for the organization development of DWRID. The project proposes to continue implementation through the special purpose project implementation vehicles already set up during phase I and sustainably supported by the Government even after closure of Phase-I.

8.1 Experience from Phase-I

DWRID with its mandate to provide MI services to the farmers of the state successfully spearheaded implementation of the project mobilizing composite competencies in the field of community development, farmer institution building and agriculture related livelihood activities in addition to its core competencies in irrigation related engineering. Supported by a Steering Committee at the state level the implementation lead was taken by SPMU. The upgradation of the Project Director's position to Secretary level (September 2016) brought in substantial success in leadership and project management. At the district level, the DLICs and 23 DPMUs were instrumental in managing the project at the district and village level. The technical experts from the SPMU and DPMU ensured coordination and integration with the activities of line departments-agriculture, horticulture and fisheries. As part of Component—Strengthening Community Based Institutions services of NGOs were hired to provide backstopping support to WUAs. The success of the project management during phase I is also evidenced from the convergence it achieved with other ongoing Government programs and establishing partnership with the private sector which leveraged technological and economic benefits to project farmers.

8.2 Objective of the Component

The objectives of the component are:

- (i) to provide backstopping, coordination and oversight support to farmer institutions-SHG, FIGs and WUAs at the primary level and clusters of WUAs at the secondary level;
- (ii) to comprehensively build the capacity of DWRID and other relevant government agencies to sustainably support farmers and their institutions;
- (iii) to build synergies, partnership and collaboration with private sector and non-government organizations; and
- (iv) to deepen, scale up and universalize farmer-driven and participatory irrigation and related services in the state.

The component consists of three sub components:

- (i) **Sub Component D.1:** Project Management and Co-ordination;
- (ii) **Sub Component D.2:** Monitoring, Learning, Evaluation and Communication; and
- (iii) **Sub Component D.3:** Organization Development

8.3 Sub Component D.1: Project Management and Co-ordination

The Sub Component will facilitate overall co-ordination, planning, implementation and quality assurance of the project. The SPMU and the DPMU will be supported to act as the guardian of participatory irrigation management principles and water resources conservation practices.

8.3.1 Objectives of the Sub-component

The objectives of the sub component are to facilitate overall planning, coordination, implementation and oversight of the management of the project implementation at the state, district and village level.

8.3.2 Outcome Indicators

The success of the sub component is assessed through: (i) percentage of staff positions at state and district level occupied by competent and qualified personnel who will serve in their positions for at least two years; (ii) percentage of WUAs assessing the services received by them as adequate, timely and satisfactory.

8.3.3 Activities of the Sub Component

The main activities to be supported under the sub component are:

- (i) Preparing and updating Project Implementation Plans (PIP) and detailed technical manuals;
- (ii) Strengthening the overall office establishments of state level SPMU and district DPMUs;
- (iii) Hiring and deployment of facilitating staff to manage the units comprising of Government employed and privately recruited specialists;
- (iv) Providing computers, servers, software and other IT equipment to supplement the existing infrastructure;
- (v) Furnishing office and office equipment as required;
- (vi) Supporting Steering Committee, DLIC and other coordinating meetings and workshops as required;
- (vii) Procuring technical assistance and other outsourced services for the smooth implementation of the sub component; and
- (viii) Establishing Grievance Redress System.

- **Project Implementation Plan (PIP) and Technical Manuals:** The project implementation will be guided by Project Appraisal Document (PAD), Financing Agreement (FA) and PIP. While the first two documents set out the overall design, policy and obligations of State Government and the World Bank, the operational guidance is provided in the PIP. As an elaboration of the PIP detailed technical manuals will be prepared for Component-A (WUA manual), Component-B (Engineering and Irrigation manual), Component-C (Agriculture, Horticulture and Fisheries Manual). The field level implementation of the project shall be in accordance with the PIP and technical manuals agreed with the World Bank. Any changes and updates to the PIP shall be in writing and with the no objection from the World Bank.

- **Strengthening SPMUs and DPMUs:** Existing arrangements at state and district level will be supplemented with office infrastructure, Computers, servers, software and other IT equipment and logistical support. The SPMU and DPMU in addition to programmatic function will also undertake fiduciary responsibilities, logistical support, human resource function, maintenance and contract management of all equipment and services procured lacing and convergence with other line departments, private sector, NGOs and other agencies.

- **Human Resource Management of Personnel required:** In accordance with the agreed responsibilities and person descriptions facilitating staff responsible for key administrative and programmatic Functions-Engineering, IT, Agriculture, Horticulture, Fisheries, Institutional, Community Development and Farmer Support, Agricultural marketing etc. and Human Resource Management including hiring, performance, evaluation and disbursement of salaries and benefits. The SPMU and DPMU will develop Human Resource policy to ensure that all facilitating, backstopping and resource staffs are fully functioning with clear job responsibilities and accountability mapping.

- **Procuring office equipment, computers and other IT equipment and logistics:**
- **Institutionalizing policy and strategic oversight by the State Government:** The already existing Steering Committees, DLICs and other coordinating structures at the Government level both at the state and district level will be strengthened. Organizing meetings, following-up on decisions taken and running consultative workshops and other discussions are part of the activity.
- **Liaising and convergence with Government departments and other agencies:**
- **Synergizing support and collaboration with private sector and NGOs:** Identifying networking and other linkages required for the attainment of project objectives at the WUA level will be the key activity. For all collaborating institutions roles and responsibilities and commitments of the project and partner will be established through signing of a Memorandum of Understanding (MoU). For those institutions including NGOs and research agencies procured for delivering services appropriate contracting documents will be signed with attached detailed description of services. Contract management will be the responsibility of SPMU or DPMU at the required level.
- **Establishing GRM:** The project will also establish a grievance redress system both at district and state level to address compliant and other grievances of farmers and general public.

8.3.4 Implementation Arrangement

The implementation arrangement will be the same as the one set up for phase I with additionalities as justified for the requirements of phase II.

- **Project level Steering Committee:** The implementation arrangement consists of a State Level Project Steering Committee headed by Principal Secretary DWRID for overall monitoring and oversight.
- **The State Project Management Unit (SPMU):** State Project Management Unit (SPMU) headed by Project Director for overall project implementation. The SPMU consists of a combination of few dedicated government staff, seconded government staff and a team of contractual staff and specialists to be sanctioned by the Finance Department.
- **District Level Implementation Committee:** The arrangement at the district level includes the District Level Implementation Committee (DLIC) headed by the District Magistrate. The DLIC correspond to the Steering Committee at the state level.
- **The District Project Management Unit (DPMU):** The District Project Management Unit (DPMU) headed by District Project Directors. The DPMUs are staffed with seconded officers from the department and contractual positions are also to be sanctioned by the Finance Department.
- **Village/Scheme level Project Management:** Though the implementation at the village level is vested with WUA and its arms, their backstopping linkage relationships with DPMU will be facilitated by Support Organizations (SO). SOs are NGOs experienced in community development and farmer institution development hired mainly for supporting WUAs under the Component A-Strengthening Community-based Institutions.
- **Skill set at SPMU and DPMU level:** The overall activities require trained and experience manpower to deal with both at SPMU as well as at DPMUs level. Now to use the available big structure

of trained manpower created under the WBADMI Project-Phase-I over the years in the most productive and effective way, the total strength consists of core staffs, contractual staffs, consultants and support staffs will have to continue in precise way in Phase-II with creation of some new posts in multiple disciplines as per the requirement. The detailed organogram is included in the chapter I-Implementation Arrangement

- **Staffing at SPMU and DPMU level:** The project institutional arrangement during Phase-I where 57(fifty-seven) **Govt. posts** of different categories were created on purely temporary basis vide U.O. No. 2380 dtd.26.11.14, 0369 dtd.17.11.16, 0215 dtd.07.06.17, 0733 dtd.10.11.17 & Gr-T/2020-21/1063 dtd.03.03.2021 respectively. But in Phase-II, out of 57(fifty-seven) posts, a certain number of Govt. posts of different categories posts would have to be created permanently at Department of Water Resources Investigation and Development and transfer the same to West Bengal Accelerated Minor Irrigation Project Phase-II to form a dedicated Government team at least at State level which may act as a skeleton body after the withdrawal of the Project. This body may add on the contractual staffs and specialists as per requirement and the team may nurture the entire WUAs formed during Phase-I & II and WUAs formed against the departmental schemes whom still needs assistance for the sustainability. Also, some additional Govt. posts may have to be created in Phase-II on purely temporary basis as done earlier in Phase-I to cope up with the multifarious work undertaken in Phase-II. The overall project staffing required for phase II in comparison with phase I is summarized in Table 8.1.

Table 8.1: Overall Staffing Requirement for Project Management

SL. No.	Team	Total Required Number in Phase-II	Sanctioned Number in Phase-I	Additional Number to be Sanctioned in Phase-II	Remarks
1	SPMU & DPMU CORE STAFF	67	58	9	All sanctioned number of core staff of SPMU & DPMUs in Phase-I are purely temporary basis except the post of Project Director, WBADMIP
2	SPMU CONTRACTUAL STAFF	56	37	19	19 new/additional contractual posts of different disciplines may be sanctioned for SPMU in Phase-II
3	DPMU CONTRACTUAL STAFF	387	411	-24	Added 27 additional/new posts in Phase-II and dropped 51 posts of Phase-I i.e. 24 no. of posts reduced in Phase-II in respect to Phase-I
4	CONSULTANTS	15	14	1	1(one) fishery consultant in additional may have to be engaged at SPMU in Phase-II
	TOTAL	525	520	5	

8.4 Sub Component D.2: Monitoring, Learning, Evaluation and Communication

Monitoring, Learning and Evaluation forms an integral part of project management and the sub component will aim at institutionalizing the robust online monitoring program already implemented during phase I.

8.4.1 Experience from Phase-I

During phase-I the SPMU implemented a web-based GIS and spatial MIS through an in-house GIS and MIS team. The technology architecture integrating remote sensing, GIS and the MIS system helped the project management in various application areas like identifying project areas, planning and selecting scheme locations delineating micro water sheds, online geo-specific design tool, online

SDMP preparation and integrated monitoring of schemes, progress, crop monitoring and overall evaluation for MTR and ICR. A noteworthy feature of the technology enabled monitoring during phase I is scaling up of the system for other government projects like 'Jaltheertha' and adoptions by many NGOs.

8.4.2 Objectives of the Sub-component

The ongoing project monitoring, evaluation and learning activities (MEL) using web-based M&E platform will be strengthened to improve tracking of the project progress, responding to operational aspects and smoothen project implementation and irrigation service delivery across project sites and districts. In addition to the conventional progress tracking and impact evaluations, the sub component will also support implementation of component B by facilitating online planning, digital documentation and remote sensing-based impact mapping. In addition, the sub component will support Component C with mobile app-based advisory services.

8.4.3 Outcome Indicators

The success of the sub component implementation will be assessed through:

- (i) Timely publication of quarterly progress reports and annual reports;
- (ii) Maintenance of a state of the art, website and web-based services on project related statistics and publications including APIs for database, GIS based information packs; and
- (iii) Timely publication of results of thematic studies, learning forums and evaluations.

8.4.4 Activities of the Sub Component

The main activities to be supported by the project under the sub component are:

- (i) Designing and establishing project specific management information system including results;
- (ii) Planning annual work program and quarterly progress report production;
- (iii) Designing and implementing evaluation studies including special studies;
- (iv) Campaigning and communicating; and
- (v) Learning and knowledge management.

- **Web-based spatial MIS:** The M&E platform will support a farmer participatory implementation and monitoring to help DWRID, SPMU, DPMU, SOs and WUAs to participate in the monitoring activities by sourcing and uploading geo-spatial data including photographs to monitor, learn and communicate project progress, results monitoring, impact monitoring and process monitoring. The project website will contain dashboards of project progress and possible links with M&E platform to share lessons and knowledge products.

- **Annual Work Planning (AWP) and Quarterly Progress Reporting (QPR):** The project will follow a hybrid bottom-up and top-down approach in preparing AWP and annual budgets including procurement planning. Quarterly, half-yearly and annual progress reports are generated from MIS. The first AWP covering initial 18 months and related budget is given in Attachment 8.1.

- **Evaluation and Thematic Studies:** The project will carry out and published mainly two evaluation studies covering the whole project, one during mid-term and another at the end of the project. The focus of evaluation will be achieving the results and intermediate outcomes set out in the agreed Result Framework (RF) and within the conceptual background of the Theory of Change (ToC). Special studies as required will also be commissioned covering different thematic areas.

- **Campaigning and Communicating:** The project will run information, education and communication campaigns promoting water resources management, participatory delegation

management, climate change related adaptations, safe food and nutrition etc. The sub component will also have communication activities to disseminate emerging project models and to sensitize policy makers, practitioners and general public aware of lessons and good practices emerging from the project.

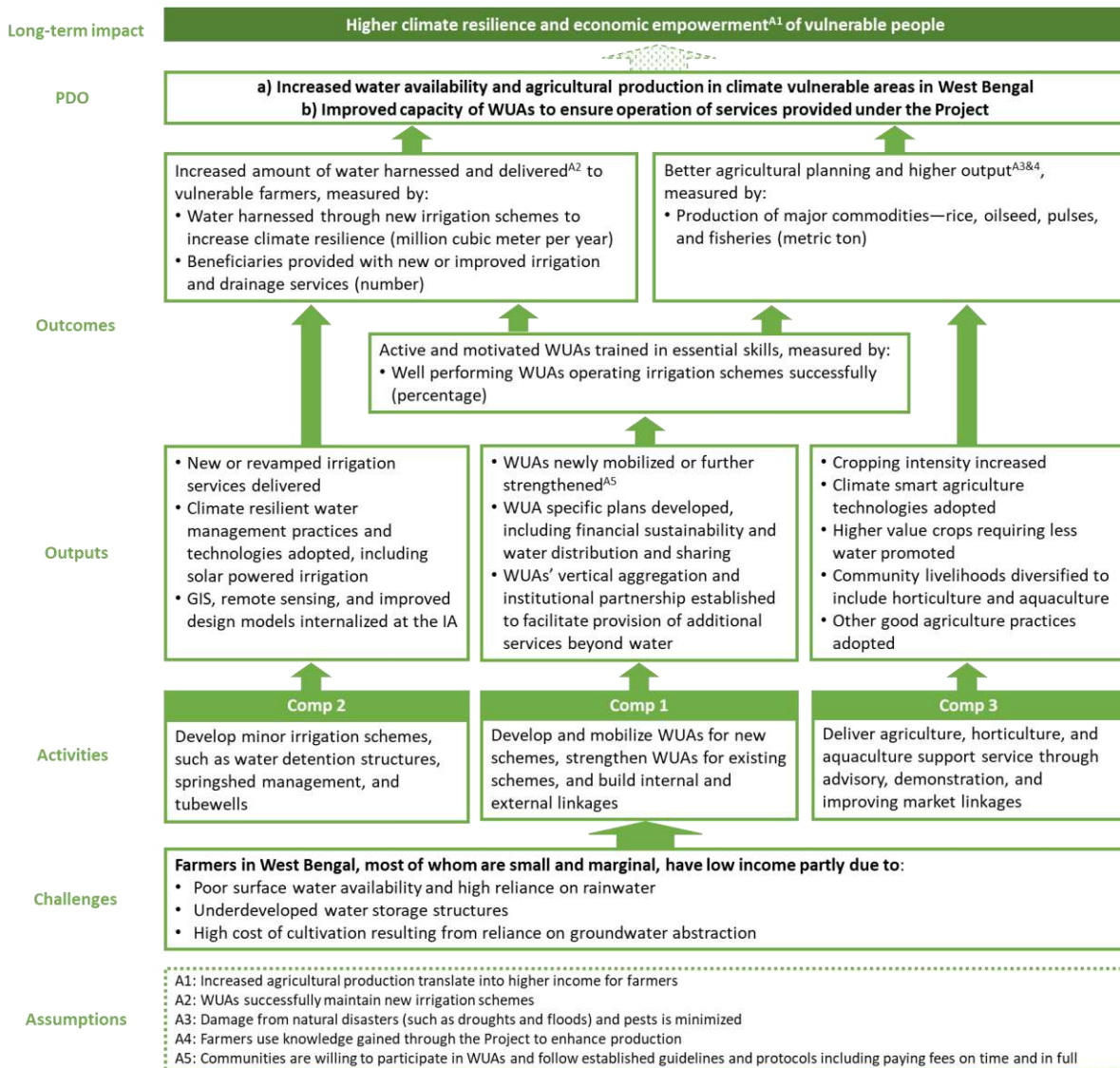
- ***Learning Sharing and Knowledge Management:*** The project will conduct annual learning sharing workshops. The first level will be conducted at the district level involving WUAs and the second level will be done at the state level with the involvement of representatives from all stakeholder groups. The project will prepare field notes to showcase and share best practices and learnings. The thematic learning will be on technology, livelihoods and farmer institutions including WUA. The key learnings from the districts will be consolidated at the state level and implementation challenges will be brought to the attention of the project management and best practices will be scaled up across the state.

8.4.5 Implementation Arrangement

The SPMU will be primarily responsible for the project ME and L activities. Within the SPMU two internal units MIS and GIS will be set up to manage data information and knowledge. The DPMUs will also have similar skills to support. Most of the applications and capabilities will be internally developed and wherever required limited outsourcing will be attempted. The evaluation studies will be outsourced to experienced external agencies.

8.4.6 Theory of Change

The development change being envisaged and the project designed for achieving the PDO is conceptualized in the form of a Theory of Change. The project components and main activities have been chosen carefully to have direct contribution for achieving the results and intermediate results envisaged for the project. While evaluating the project, the ToC will guide the analysis of how successful the components and activities contributed to achieve the project development objective. The ToC is presented in Figure-8.1.

Figure 8.1: Theory of Change

8.4.7 Results Framework

Results Framework prepared for the project form the basis of evaluating the success of the project in achieving the PDO. The RF clearly defines the PDO indicators and intermediate indicators for covering each of the project components. The target values of these indicators over the project years and at the closure of the project are agreed upon by the Government of West Bengal with the World Bank as included in the PAD. The RF of the project is given in Attachment-8.2.

8.5 Sub Component D.3: Organization Development

Though listed as last of the components, the sub component will ensure the sustainability, scaling up and institutionalization of the models, innovative tools and best practices showcased and demonstrated by the project beyond the project areas and timeline.

8.5.1 Experience from Phase-I

The phase I successfully proved the robustness of the implementation arrangement, effectiveness of the participatory processes followed and got wide spread acceptance of the design standards innovated. In fact, the project turned out to be a flagship program for the Government recognizing and realizing the state's vision on irrigated agriculture and farmer livelihoods. The project approach was scaled up in the Government run 'Jaltheertha' program. The watershed development program of the Government adopted the GIS tool on water resources management.

8.5.2 Objectives of the Sub Component

The main purpose of the sub component is to consolidate the innovative models and technology reforms achieved during the project and create an enabling policy environment for state-wide scaling up. These will be further refined through institutional capacity building of DWRID through support to internalize and institutionalize the implementation arrangements, implementation processes and design standards emerging from project implementation.

8.5.3 Outcome Indicators

The success of the sub component will be evaluated through:

- (i) Adoption of design standards, implementation tools and methodologies, project evolved models for scaling up by GoWB (adoption of WUA institutional model state wide, adoption of SDMP-tool as well as process state wide etc.);
- (ii) Establishment of a unit with a scaled down structure and skills similar to SPMU/DPMU at state and district levels within DWRID to sustain the project approach/principles beyond project period.

8.5.4 Activities of the Sub Component

The main activities are:

- (i) Producing and adopting technology and process like design and planning PIPs, internalizing usage of GIS and remote sensing etc.;
- (ii) Providing technical assistance to refine systems and procedures, support to Government to develop policies, rules and procedures for institutionalizing farmer participatory irrigation management;
- (iii) Establishing two cells within DWRID-one for WUA and another for participatory planning and designing;

- **Internalizing and Institutionalizing technology and processes:** The project will hire technical assistance for the purpose. Several internal learning, dissemination and awareness building workshops, discussions and consultations will be held with field level, mid-level and policy level staff of the DWRID.

- **Establishing WUA Cell:** The engineering skills of the DWRID will be augmented by social engineering skills for mobilizing farmers, their institution building and development and capacity building and organization development of WUAs. The cell will also establish the liaison work to leverage convergence with line departments and private sector.

- **Establishing Participatory planning and design units:** The participatory methodologies developed will be internalized through the unit for site selection, scheme design, clustering process, standardizing scheme guidelines and adopting design tools by the zones and districts. In addition to planning and design, the unit will incorporate GIS and remote sensing based MIS, digital documentation, impact monitoring and real time monitoring of MI scheme performance including cropping patterns, soil moisture patterns, climate monitoring for crop planning etc.

9. INSTITUTIONAL AND IMPLEMENTATION ARRANGEMENTS

To be included soon

10 WATER USER'S ASSOCIATION (WUA)

Water User Associations is the most important farmer institution responsible for implementation of all project activities at the village level. In large irrigation service facilities one WUA may cover entire village and in smaller ones, one WUA may cover more than one irrigation unit. WUAs are inclusive, representatives and autonomous farmer institutions, registered under Societies Registration Act, 1961 (Attachment 10).

The basic objective of the WUAs is to build the ownership and capacity of the farmers to collectively operate, maintain and manage the water resources created for them. However, the broader objective of WUA is effective utilization of water resource created and managing that scarce resource efficiently among the members to enhance productivity, do crop diversification and thereby augmenting the household income.

10.1 Experience from Phase-I

The phase-I of the project showcased as a best practice establishment of Water User Associations (WUA) as inclusive farm organizations for equitable and sustainable irrigation services. The main lessons and scaling up strategy from phase-I are included in Chapter-5 on Component A description.

10.2 Membership

All farm households in the command area of new irrigation system set up under the project are eligible to be members in the WUA irrespective of cast, religion and land size. Absentee farmers can also become members of the WUA. The direct benefitting farmers from MI schemes, orchard and fishery as promoted by the project can only be the member of WUA. Farmers, who are not benefitting from the project directly, irrespective of his/her influence in community, cannot be a member of the WUA which includes general body as well as managing committee. The head of the family including women headed families are members with voting rights. Each household is represented by one member from the family and special focus is given to include the female member of the household as the WUA member. If two members from one household join the WUA, only one of them will have the voting rights. In short, household will be considered as member with single voting right.

10.2.1 Inclusivity

All farmers who benefit from the MI unit are eligible to become members in the WUA. All small farmers, marginal farmers, share croppers, women farmers and tribal farmers are not to be excluded from membership.

10.2.2 Size of WUA

There is wide variation in the command area and number of farmers benefited from different scheme types which may also vary across project areas. In MI schemes covering larger command areas the membership in a WUA can go as high as 200. Nearby smaller schemes are clustered and WUAs are formed with smaller number of members, say as low as 20.

10.2.3 Membership Fee and Subscription

WUAs charge a membership fee as well as annual subscription. The membership fee ranges from Rs.60 to Rs.600 (with average Rs.200) based on scheme type, performance of scheme, region and category of farmer. The amount of membership and annual subscription are recommended by the MC and approved by the GB. WUAs charging moderate membership fee are more sustainable and

tend to be active. WUAs may be encouraged for promoting one time joining fees as mutually decided by the befitting farmers.

10.2.4 Corpus building

This may be called an important activity regarding WUA development. It is seen that the WUAs who have considerable amount of Corpus Fund, are functioning better than other WUAs as per various aspects of Grading System (A+,A,B,C&D). Better corpus led to the following –

- Participation in any meeting is better (60-90%) as every member have considerable amount of share in the corpus fund.
- Regular meeting is held on fixed date
- Most of the members are aware of the activities from which he/she is not directly benefited. Hence adaptations/disseminations of profitable activities are increased at a high rate.
- Lesser conflict in the WUA
- Have transparency in the financial matter
- Improved confidence and better risk-taking capacities at WUA level
- Scope of taking up need-based entrepreneur activities using corpus
- Periodic operation and maintenance of MI schemes

The WUAs having a sizable volume of corpus amount in bank, showcased better sustainability, and coping mechanism during COVID 19 crisis. WUAs with fund could maintain their MI schemes much better ways. All WUAs during Phase-II should be encouraged for generating corpus from the very onset. Surplus fund may be kept as fixed deposit and could be utilized for entrepreneurship activities as per requirement. Beside water charges and members ship fees , WUAs may impose one time joining fees and percentage of revenue sharing from any supports either received through project or convergence. Apart from that, while receiving any input support from project or elsewhere, WUA may decide to pull a fund for corpus through members contribution which may be proportionate or less to the input support cost. The amount for such contribution needs to be fixed collectively taking into consideration the affordability of last mile farmers.

10.3 Key Roles of WUA

The main roles of WUA are:

- (i) Reflecting farmer needs and realistic field situation in SDMP;
- (ii) Ensuring that MI schemes are executed as designed in the SDMP with quality;
- (iii) Decisions on irrigation service fee and ensuring its prompt collection;
- (iv) Efficient utilization of available water resources through equitable sharing;
- (v) All records and accounts are maintained and updated;
- (vi) Supporting members in agriculture, horticulture and fisheries livelihood activities; and
- (vii) Community monitoring, social accountability, learning sharing and promoting good governance.

In a nutshell it may be concluded that the key roles of WUA-

- **Maintenance of Irrigation infrastructure** – Acting as an interface between the farmers and the water resources created for operation and maintenance of MI schemes.
- **Water management** – Preparation and execution of Water distribution plan, addressing misuse, enabling judicious use of water, proactive disclosure, conflict management etc.
- **Agriculture Development** – Preparation and execution of Crop plan, Water budgeting, demonstration of agriculture technology and practices and adoption of the same wherever possible.

- **Resource mobilization for sustainability** - Membership fees, Water charges, revenue collection from lending agriculture equipment, selling of water beyond command areas, fish pond, etc.
- **Convergence with other department / agencies** - Linking with other line department , program, receiving capacity building as well as other input support for better sustenance.

10.4 Organizational Structure of WUA

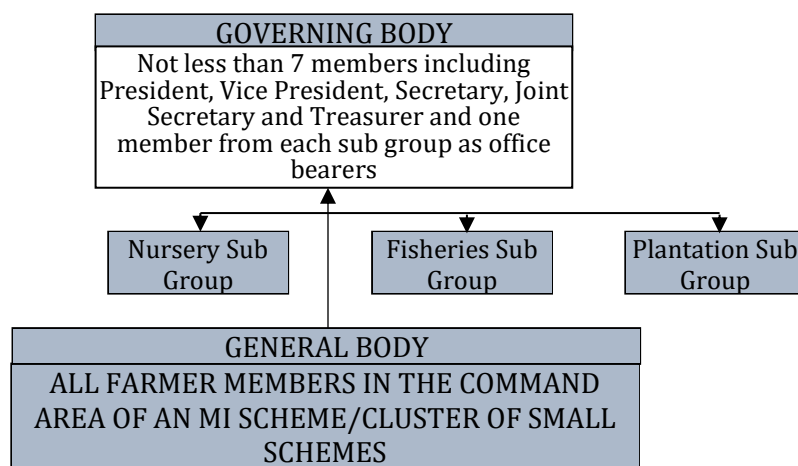
WUA form the basic farmer organisation at the schemes/village level responsible for project implementation. The most important decision-making body is the General Body comprising of all benefiting farmers which will entrust the day-to-day management and operation aspects to a representative management committee (governing body). **Though not part of the formal organizational structure of WUA** there is a sub-General Body layer comprising of Self-Help Group members and Community Interest Groups (CIGs) which are organically linked to WUA and collaborate with it in many activities especially at the livelihood level.

The Organizational Structure of WUA consists of:

- A general body composed of all benefiting farmers in the command area of a MI scheme;
- Management Committee consisting of President, Vice-President, Secretary, Joint Secretary, Treasurer, one member from each sub group; and
- Sub committees for nursery, fishery, plantation etc.

The Organizational Structure of a typical WUA is given in Figure 10.1.

Figure 10.1 Organizational Structure of WUA



The detailed composition and functioning of different entities in the WUA are summarized in Table 10.1.

Table 10.1: Structure and Composition of WUA

Sl. No.	Entity Name	Composition	Main Responsibilities
1.	General Body	• All farm house holds in the command area of a minor irrigation scheme are members; • Households itself will be considered as WUA member with single voting rights; • Each house hold is represented by the head of the family or women counterpart;	• All key decisions are taken by GB; • Approving and amending bye-laws • Admitting new members and removal of members • Election of office bearers and management committee members; • Approval of irrigation scheduling and water allocations;

		From women headed house-holds women are the members	- Fixing water charges and other fees to be collected from members; - Approving plans, proposals and budgets recommended by management committee; and - Considering audit report and approving corrective actions
2.	Self Help Groups	- The SHG (women) members who are from benefitting WUA households; - WUA may outsourced activities SHGs who are organically linked to WUAs.	- SHGs perform the savings and credit roles - Extend loans for livelihood activities - Financial intermediation with banks - Support WUA in book keeping - Take part in economic activities
3.	Management Committee	- Three office bearers-President, Secretary and Treasurer - Vice President and Joint Secretary are also members - Seven to Eleven members depending upon size of membership - Tenure of management committee members-one year, eligible to be re-elected for not more than two consecutive terms - At least two members shall be women and one of whom an office bearer	- Supervising scheme implementation - Supervision of irrigation management - Facilitation of livelihood support - Day-to-day functioning of WUA - Conducting meetings, maintaining minutes - A minimum of dual signatory for handling bank related operations
4.	Sub Groups	- five to ten members selected by General Body. - One member from each Sub Group in managing committee for coordination. Sub group will be formed as per need and type of group may vary according to activities.	- Regular meeting, follow ups and maintaining primary records and finance - Coordinate profit sharing to WUA - Facilitate training and other capacity building activities for sub group members and other members for adaption and replication

10.5 Governance Arrangement

The organizational structure of WUA facilitate practice of good governance, for the smooth functioning and ensuring equitable benefits to all members including the most vulnerable. The governance arrangement has been described in detail in chapter 5 on Component A Description.

10.5.1 Decision Making Arrangements

All decision making by the WUA are taken by following due processes as below.

- (i) All important decisions impacting members are taken at the general body meeting;
- (ii) A decision to be approved in the general body or MC need to be agreed by majority of members attending and more than fifty percent of women present have also to agree;
- (iii) Pro-active disclosure will be in place for maintaining transparency and trust among members with regard to financial and other key decisions.

10.5.2 Meetings and attendance

WUAs shall regularly convene the GB and MC meetings as prescribed by the bye-law and as often as needed by considering the actions and urgencies. The frequency and other details for the meetings are in Table 10.2.

Table 10.2: WUA0-Meetings and Attendance

Body	Frequency	Attendance	Responsibility
General Body	At least once in six months	• At least 50% of members and 50% of women members • Decisions are to be agreed by at least 60% of members attending and 50% of women attending	Secretary to issue notice and record minutes
Management Committee	At least one meeting per month	• At least 80% of members and 60% of women members • Decisions are to be agreed by at least 70% of members attending and 60% of women attending	Secretary to issue notice and record minutes

The general body shall be attended by at least fifty percent of members of which at least twenty percent shall be women members. The frequency of meetings and

10.5.3 Ensuring Transparency

All receipts and payments on a three-monthly basis, physical progress information and important decisions of GB and Management Committee shall be displayed by WUA notice board. Key findings from the audit report are discussed in the GB and displayed in the notice board. Both for GB and MC, minutes book is maintained with recording of all important decisions and signature of members attending. The books of accounts are regularly updated (not later than a month) signed by the Treasurer. The President/secretary shall verify the books of accounts and put their signature certifying correctness every three months.

Through proactive disclosure like wall writing etc. WUA will aware all members on financial and other issues. During General Body meeting financial issues will be discussed. WUA will set a fixed date, venue and time for GB meeting. It will be displayed and communicated to all members through notice boards, home visits etc. It is described in details in Chapter 5.

10.5.4 Records and Registers

The WUAs are to maintain the following basic registers:

- (i) Membership Register
- (ii) Cash Book;
- (iii) Petty Cash Book;
- (iv) Ledger Book
- (v) Bank Pass Book (updated at least every 15 days from the Bank)
- (vi) Pump Log Book;
- (vii) Water charges Register;
- (viii) Minutes Books for GB and MC;
- (ix) Crop Planned and Actual Cropping Register;
- (x) Irrigation Schedule Register; and
- (xi) Other Services Register.

10.5.5 Financial Accountability

The WUA leadership and FM committee are to maintain utmost financial prudence and transparency. All receipts and payments of WUA money shall be accounted for. Financial authority for office bearers, treasurers and FM committee members shall be fixed upfront and complied with. Adequate documentation in support of all payments shall be under two signatories. The bank account of the

WUA is to be operated by two signatories as authorised by the management committee. The FM committee shall prepare the receipts and payments report every quarter, verified and approved by the MC and presented in the GB as and when held. The accounts are to be audited every year and audit report findings are presented in GB.

10.5.6 Benefit Tracking Arrangement

Equitable distribution of water and benefits from the working of WUA are to be ensured. In order to keep track that equitable benefits are received by all member farmer, a benefit tracking mechanism will be implemented as shown in Table-10.3

Table 10.3 Benefit tracking Matrix for WUA (No. of farmers)

Category of Farmer	Total No.	Membership in			No. of crops raised			Area Irrigated			Livelihood Support received		
		GB	MC	SC	Single	Double	Three	Less than 1 acre	1 to 2 acres	More than 2 acres	Agriculture	Horticulture	Fisheries
Small Farmers													
Marginal Farmers													
Share Croppers													
Women Farmers													
Tribal Farmers													

10.6 Management Operation and Maintenance (MOM)

Management, operation, and maintenance of the irrigation infrastructure is considered as key task of WUA. The WUA need to strictly monitor the following, at regular interval- the crop plan as well as the water distribution schedule. Special care must be taken so that water, which is a scarce resource, is utilized efficiently. This will reduce wastage of water as well as streamline the water distribution initiative. Such strong monitoring helps in strengthening the WUA and are essential for long term sustainability. There is a requirement of hiring a pump operator may be important as then the responsibility of operation can be entrusted upon one/ or two individuals. However, the pump operator also needs to be provided with an honorarium/ service charge so that the interest of the pump operator continues.

Maintenance is another most important task of the WUA. The pump set, the distribution channels, the distribution pipes and all other machinery need to be inspected regularly to ascertain the need for any maintenance activity. An annual infrastructure maintenance plan needs to be chalked out, with special care for emergency provision so that in case any malfunction happens, the water distribution schedule is not hampered. The WUA may develop a special fund to buy and stock in spare parts. The WUA also need to insure the irrigation infrastructure against theft and damage and opt for annual maintenance.

Based on all probable expenses (both operation and maintenance), the WUA need to be supported by the SO and DPMU for designing crop specific water charges. While designing water charges the following expenditure heads should be kept in mind

- The salary/ honorarium of the pump operator;
- Monthly electricity charges/ diesel expenses;
- Maintenance cost;
- Expenses for various books of account;
- Meeting expenses;
- Annual audit & renewal of registration, PAN card related expenses;
- Misc. expenses

In Second Phase, the focus would be on surface based schemes including CD, WDS, etc. Project may provide central lifting device run by solar for better control over water. In case of centralised lifting devices (portable or fixed) and mostly operated using solar energy, WUA under the support of SO should fix a water charges. Distribution of water should be based on crop planning and water requirement mechanism. While fixing water charges along with other parameters, repair cost for soar system needs to be taken into consideration.

Grounding of using tensio-meter needs to be promoted at scale. All WUAs will be provided thorough training on tensio-meter uses and will be mobilized to provide partial contribution if project make arrangement of such equipment for WUA.

10.7 Crop Planning and Irrigation Scheduling

The core task of a WUA is to make irrigation water available to all its members at the required time. This step targets to develop a strong planning architecture in WUA. For this the WUA need to do crop planning and water planning based on the water availability. This exercise has to be conducted before every season, rigorously. In absence of a proper planning, major cases of disputes may erupt at a later stage. The crop and water planning will help in developing the water distribution schedule.

A good water schedule will be dependent on the exact knowledge of-

Discharge capacity of the irrigation infrastructure

- The total command area
- The different crops that can/ will be done in each of these plots
- The soil type and the water retention ability of the soil
- The climatic condition like total precipitation, the number of rainy days, rain intensity, evaporation rate, the wind speed, maximum and minimum temperature.

Based on all these data, the WUA need to develop the schedule in a participatory manner by involving all the members – the number of hours of pump operation, which plot to be irrigated and when and the amount of irrigation water required in each of the plot. Sometimes in case of electricity operated pumps, the schedule timing must sync with the electricity timing.

For WDS, CD etc. surface based schemes, calculation of available water in each season is an important factor. Availability of water and selection of crops are factors to determine the coverage areas. WUAs through SO would be imparted training on calculating water volume using local resources and knowledges for surface run schemes. A separate module for water volume calculation will be developed in consultation with stakeholders.

10.8 Water Charges

Water charges collected from irrigation receiving farmers forms the main income for WUAs. Water charges are decided based on area of cultivation, cropping season, recovery of maintenance charges etc. The water pricing mechanisms are:

- (i) Based on irrigated land size;
- (ii) Based on irrigation time
- (iii) Based on quantum of water used;
- (iv) Based on crop irrigated area;

The WUA will prepare proposals for water pricing. The MC will recommend the pricing to be approved by the GB. Whatever be the basis for pricing, the charges will be lower for kharif than rabi and pre monsoon.

The most important task in this domain is to regularly collect the overdue water charges and bring in a system of penalizing members who willingly default to pay the agreed charges.

A system should be put in place for electricity charges are paid at regular frequency so that uninterrupted power supply is ensured.

It should be ensured that the electric connection type must be Commercial (Agriculture) instead of only Commercial for fixed and lower rate of energy charges.

10.9 Conflict Resolution

The members of the WUA can raise their complaints and resolve conflict through a built-in mechanism as narrated in the table 10.4.

Table 10.4: Conflict Resolution Mechanism for WUA

Steps	Resolution Mechanism	Timeline
Step-1	- Aggrieved member submits complaint to Management Committee - Management Committee, calls for details from the sub-committee concerned and tries to resolve the issue with the satisfaction of the complainant	15 days
Step-II	- The complaints remaining unresolved is referred to the SO - The SO enquire the issue and try to issue the conflict together with the general body and other concerned party/ies - The solution is approved in the general body	30 days
Step-III	- Still unresolved complaints/issues are referred to DPMU - DPMU will communicate its solution through the Management Committee	45 days
Step-IV	- Unresolved complaints are referred to the SPMU - SPMU will communicate the solution through DPMU and Management Committee	60 days
Step-V	- Unresolved complaints are referred to the Project Director - The PD's solution shall have binding on all and members have to comply with it	75 days

The MC will maintain a register of all the complaints received and steps taken to resolve them. Each complaint received as serially numbered and tracked for resolution with dates.

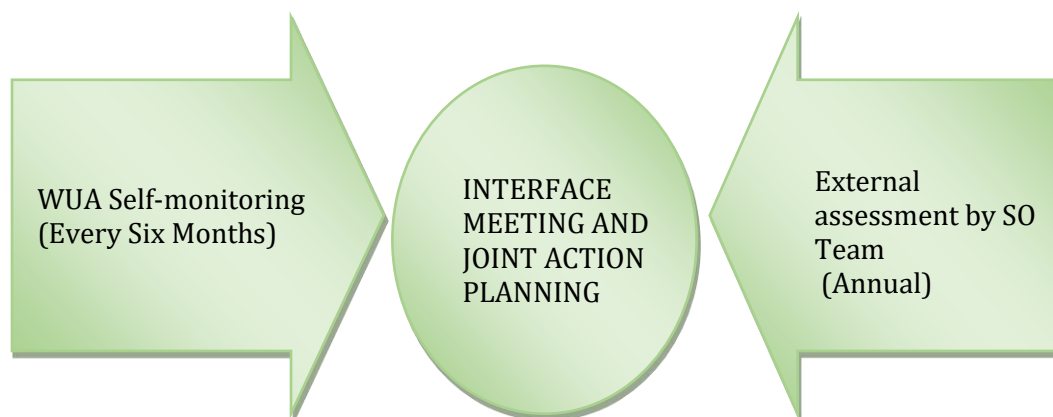
10.10 Progress Monitoring and Grading of WUAs

The efficiency and the sustainability of WUA depend on monitoring of the performance of the WUA by its own members. The main farmer monitoring tools are: WUA meetings, books and records. The WUA may be facilitated to conduct self-rating periodically to oversee their progress and challenges.

Besides, department / DPMU with the help of support organization may administer the same score card/ separate score card for review and outcomes may be shared to the WUA. In addition, the SO and WUA should work jointly to prepare a WUA focused action plan to improve the status of WUA.

WUA grading tools/ separate score card may be converted into an app-based applications. The community worker may be trained on using the app. It would provide the project a real time information and analysis of WUA functioning.

Brainstorming and discussion is required for further improvement of the existing grading tools during Phase-II. New indicators need to be incorporated to capture fishery and plantation works related progress. This is summarized in Figure-10.2.

Figure-10.2: Process Monitoring Framework for WUA

10.10.1 Purpose of Grading and System of Assessment

The WUA grading tool is for the purpose of monitoring the quality of the WUA therefore the WUAs to be assessed should have completed at least one year of its functioning. The grading parameters and scores are summarized in Table 10.5.

Table 10.5: Grading Parameters of WUA

Grading Parameters of WUA	Max. Score	Score
1.General Body Meetings (AGM) for Crop and irrigation planning (for all types and age group of WUA)	10	
2.Regularity of WUA Management Committee Meeting (for all types and age group of WUA)	10	
3.WUA Members' Awareness and Knowledge about the Activities and Norms of the WUA (for all types and age group of WUA)	10	
4. Regularity in payment of Membership fees (last 3 years data or since inception) (for all types and age group of WUA)	10	
5.Record Keeping for General Management of WUA (for all types and age group of WUA)	10	
6. WUA Financial Record Keeping (for all types and age group of WUA)	10	
7. Audit in WUA (for all types and age group of WUA)	10	
8. Transparency of WUA Functioning (for all types and age group of WUA)	10	
9. Convergences / Linkages with other institutions by WUA (only for WUA who has done at least one cropping cycle)	10	
10. Cropping plan preparation by WUA (only for WUA who has done at least one cropping cycle)	5	
11.Mapping of water requirements against cropping plan by WUA (only for WUA who has done at least one cropping cycle)	5	
12.Peparation of the water release schedules by WUA (only for WUA who has done at least one cropping cycle and for WUAs with control on water distribution)	5	
13.Crop Plan Adherence (only for WUA who has done at least one cropping cycle and for WUAs with control on water distribution)	10	
14.Mode of charges for irrigation	10	

15. Water efficiency methods adoption (only for WUA who has done at least one cropping cycle)	5	
16. Water management methods adoption (only for WUA who has done at least one cropping cycle and for WUAs with control on water distribution)	5	
17. Farm Mechanization adaptation (only for WUA who has done at least one cropping cycle and for WUAs with control on water distribution)	5	
18. Maintenance of the Structure (only for WUA who has done at least one cropping cycle)	10	
19. Additional Infrastructure up-gradation (only for WUA who has done at least one cropping cycle)	5	
20. Collection of Water Charges (only for WUA who has done at least one cropping cycle)	10	
21. Reserve Accumulation:	5	
22. Status of Operation charges (data from initiation or last 3 years) (only for WUA who has done at least one cropping cycle and for WUAs with control on water distribution)	10	
23. Resource Generation from other additional activities/ Services by WUA (only for WUA who has done at least one cropping cycle)	5	
24. WUA Role in agricultural extension services (only for WUA who has done at least one cropping cycle)	5	
25. WUA Role in garnering financial services (only for WUA who has done at least one cropping cycle)	5	
26. WUA Role in agriculture marketing & value chains (only for WUA who has done at least one cropping cycle)	5	
27. Agriculture Diversity: Increased area under new high value crop cultivation (only for WUA who has done at least one cropping cycle)	10	
28. Enhanced cropping intensity	10	
Please blank out the non-relevant grading parameter for the type of WUA for which grading is undertaken		
Total		

Table- 10.6: Grading of Water User Associations: Maximum Percentage of Marks

	WUA completed one crop Cycle	
Grade of WUA	WUA completed 1 cropping cycle/1 year of operation after handover	WUA has not completed 1 cropping cycle/ 1 year of operation after handover
Total Grade point	220	110
Received grade %		
A+ Matured	90-100%	90-100%
A Performing	70-90%	75-90%
B Fledging	60-70%	60-75%
C - Needs Attention	50-60%	50-60%
D - Needs Urgent Attention	< 50%	< 50%

10.11 Dissemination of 'Krishikatha' benefits within WUA

It is evident from intervention that "Krishikatha" the mobile phone based advisory services on Agriculture, Horticulture, Fisheries and other sectors are becoming popular to WUA members. So far

one lakh farmers have already been registered and started receiving the benefits. Now a robust system at WUA level is required for more interface, accurate problem identification and dissemination of information among all members. Besides, adherence of advisory needs tracking also. Every day new farmers are registering their names under Krishikatha.

- The programme becomes popular among WUA members due to the reasons are as follows:
No requirement of smart phone
- Proper advisory on Agriculture support services at free of cost and within 48 hours mostly. And storage of answer at phone for future listening.
- In case of urgent requirement scope of interaction with Experts and early response.
- Project level tracking of real problem for best solutions through visits and phone conversation and follow ups.
- Scope of getting professional and customised crop specific solutions over phone.
- Information of crop related problem and solution of the adjacent localities i.e., question and answer of farmers located locally.
- Information about weather forecast, warnings on any disasters, etc.
- Periodic research to capture farmer's requirement and analysis enable Krishikatha to provide advisory on most relevant season wise issues and problems.
- Scope of recording other issues beside ASS like MI scheme related issues, non-availability of any support, etc and proper response from concerned through tele conversation, krishikatha and field visits if required.

Within WUA a lead farmer or a group of two to three farmers may be identified by the WUA in the name of "Krishikatha Bandhu" who are already registered. They may be mobilized to train other WUA members for enrolment and handholding. In further they may help other members to share their crop photo (for better advice) to district group. They can be facilitated to monitor farmers adoption related advisory and through CW sharing it to concerned district group.

Besides, followed by the approval of project a three layers WhatsApp group may be opened for better interface. One, at WUA level involving farmers having smart phone of their own or at family level. Second at district level, Support organization wise. Here one lead member from each WUA and District team including SO would be member. Third at State level, where 2 lead farmers along with selected district and State functionaries will be member. The benefit of 3 layers group would enable information flow to WUA level both at upward or downward.

11 FINANCIAL MANAGEMENT ARRANGEMENT

The Financial Management System for the project will use the country systems and procedures. The experience from the phase I Implementation will be used to strengthen the FM system.

11.1 Financial Management System

The financial management (FM) arrangements for the project are fully reliant on 'country systems. Key design features include use of GoWB's Integrated Financial Management System (WBIFMS) and the Bank's simplified disbursement policies to mainstream the project's FM arrangement within the state's own FM framework. The FM responsibilities for the project will be vested with the SPMU established within DWRID.

11.2 Planning and Budgeting

Planning and budgeting. The SPMU will prepare a consolidated annual work program (AWP) for the project based on inputs from DPMUs. This AWP will be reflected in the allocations proposed under the budget heads created specifically for the project in DWRID's annual demand for grants.

11.3 Flow of funds.

World Bank funds will be provided to GoI and made available to the GoWB in accordance with standard arrangements between the GoI and the states. Within the state, funds will be routed through GoWB's budget and will be provided to DWRID, which will allocate budgets in the state treasury system as per approved AWP to the Project Director for further distribution to the DPMUs.

11.4 Internal control, rules, and regulations.

The internal control framework and administrative procedures applicable to the project are laid out in the West Bengal Financial Rules (WBFR), the West Bengal Public Works Department (WBPWD) Code (for the delegation of authority, etc.), and the Central Public Works Accounts Code (for accounting and reporting procedures).

11.5 Financial Management at WUA level

While no project funds will flow directly to WUAs, they are expected to be contracted by the project for implementation of different minor works. WUAs will also be expected to participate in planning and implementation and assume responsibilities for operation and maintenance of the completed schemes. The project will work with these WUAs to strengthen their capacities on delivering this mandate including on book-keeping and record maintenance.

11.6 Accounting and financial reporting

Project accounts will be maintained on cash basis. Payment for all expenses will be made electronically from the state treasury system.

11.7 External audit

The Controller and Auditor General (CAG) will be the external auditor for the project. The audit report will be submitted by the SPMU to the World Bank within nine months from the close of the financial year.

11.8 Fund flow and Disbursement arrangements

The SPMU will prepare interim unaudited financial reports (IUFRs) from the accounting records maintained in the state treasury system for submission to the World Bank within 45 days from the end of each calendar quarter. Disbursements by the Bank will be made based on these IUFRs. Under the retroactive financing provision, project-related expenditure incurred up to one year before the expected date of signing of the loan Agreement, subject to a maximum amount of US\$XX million, can be claimed.

11.9 Retroactive Financing

GoWB will not seek retroactive financing.

11.10 Disbursement Schedule

Loan funds will be disbursed under the following category/-ies subject to the allocated amount and the disbursement percentage as indicated in table 11.1 below.

Table 11.1. Disbursement Schedule

Category	Amount of the Loan Allocated (Expressed in US\$)	Percentage of Expenditures to be Financed (Inclusive of Taxes)
Goods, works, non-consulting services, and consulting services for the Project		[__%][__% for works; % __ for non-consulting services; and __% for consulting services]
Front-end Fee		Amount payable pursuant to Section 2.03 of this Agreement in accordance with Section 2.07 (b) of the General Conditions
Interest Rate Cap or Interest Rate Collar premium		Amount due pursuant to Section 4.05 (c) of the General Conditions
TOTAL AMOUNT	148,000,000	

12 PROCUREMENT ARRANGEMENT

12.1 Experience from Phase-I

12.2 Legal and Regulatory Framework

Procurement for the project will be carried out in accordance with the World Bank's Procurement Regulations for IPF Borrowers dated July 2016, and revised in August 2018 and November 2020, and the provisions stipulated in the Legal Agreement. Further, the project would be subject to the World Bank's Anti-Corruption Guidelines, dated October 15, 2006, and revised in January 2011 and July 2016. Unless otherwise agreed with the World Bank, the World Bank's standard procurement documents will be used.

12.3 PPSD

12.4 Implementation arrangements for procurement.

The DWRID of Government of West Bengal is the main implementing agency, which is supported by the existing State Project Management Unit (SPMU) and District Project Management Units (DPMUs) created under Phase I of the project in procurement function for the program. The procurement will be undertaken under the project through a National Informatics Centre (NIC) based e-Procurement portal, which has been already used by the IA in Phase I, and the same system has been cleared by the World Bank for use in this project.

12.5 Project procurement strategy.

Major items to be procured under this project are small civil works of Minor Irrigation schemes like check dams, WDS, solar based pumping system and tube wells etc. A few consultancy assignments are also envisaged. A PPSD (under preparation) has been developed for the project based on detailed requirements, capacity assessment, and market analysis. Based on the findings, decisions on packages and lots are being finalized to ensure adequate participation of bidders, which will form the part of Procurement Plan (PP). The PP shall be augmented and modified based on changing requirements during project implementation.

12.6 Procurement Methods

The project will follow the national market using Request for Bids (RFB) for procurement. There is no proposal to use the international approach or best and final offer (BAFO) or negotiations. Procurement category and method of selection process is given in Table 12.1.

Table 12.1 Procurement Category and Method of Selection Process

Category	Description	Selection Method
Works	Including supply-cum-installation works	RFB -National; RFQ - National/international
Goods/non-consultancy services	GIS, IT systems, computers and accessories, software and related items, and etc	RFB-International/National, RFQ - National including GeM; a few may be DS
Consultancy	External audit, internal audit, M&E and so on, research activities and capacity-building activities	QCBS, LCS, FBS, QBS, CQS, a few may be DS

Note: CQS = Selection based on Consultant's Qualifications; DS = Direct Selection; FBS = Selection under a Fixed Budget; GeM = Government e Market place; LCS = Least-Cost Selection; QCBS = Quality- and Cost-Based Selection; RFQ = Request for Quotations. QBS- Quality Based selection

12.7 Arrangements under National Competitive Procurement

National competition for the procurement of goods, works, and non-consulting services according to the established thresholds will be conducted in accordance with paragraphs 5.3–5.6 of Section V of the Regulations and the following provisions:

- (i) Only the model bidding documents for National Competitive Procurement agreed with the GoI task force (and as amended for time to time) shall be used for bidding;
- (ii) Invitations to bid shall be advertised on a widely used website or electronic portal with free open access at least 30 days before the deadline for the submission of bids, unless otherwise agreed in the approved Procurement Plan;
- (iii) No special preference will be accorded to any bidder either for price or for other terms and conditions when competing with foreign bidders, state-owned enterprises, small-scale enterprises, or enterprises from any given state.
- (iv) Except with the prior concurrence of the World Bank, there shall be no negotiation of price with the bidders, even with the lowest evaluated bidder;
- (v) GeM set up by the Ministry of Commerce, GoI, will be acceptable for procurement under the RFQ method;
- (vi) At the borrower's request, the World Bank may agree to the borrower's use, in whole or in part, of its electronic procurement system, provided that the World Bank is satisfied with the adequacy of such system;
- (vii) Procurement will be open to eligible firms from any country. This eligibility shall be as defined under Section III of the Procurement Regulations. Accordingly, no bidder or potential bidder shall be declared ineligible for contracts financed by the World Bank for reasons other than those provided in Section III of the Procurement Regulations;
- (viii) The RFB/Request for Proposals document shall require that bidders/proposers submitting bids/proposals include a signed acceptance in the bid, to be incorporated in any resulting contracts, confirming application of, and compliance with, the World Bank's Anti-Corruption Guidelines, including without limitation the World Bank's right to sanction and the World Bank's inspection and audit rights;
- (ix) The borrower shall use an effective complaints Redressal mechanism for handling procurement-related complaints on time; and
- (x) Procurement documents will include provisions, as agreed with the World Bank, intended to adequately mitigate against environmental, social (including sexual exploitation and abuse and GBV), and health and safety risks and impacts.

Use of GeM will be allowed instead of RFQ/Shopping for all activities with estimated value less than USD 100,000.

12.8 Community based Procurement

The project being highly participatory involving beneficiary farmers the WUAs are entrusted with procurement responsibilities as elaborated in section 5.8.

12.9 Systematic Tracking of Exchanges in Procurement (STEP)

The project will implement Systematic Tracking of Exchanges in Procurement (STEP), a planning and tracking tool, for procurement-related communications with the World Bank. Details of the procurement activities that have been prepared, including the Procurement Plan, will be entered in

the STEP tool. A few staff from the IAs have already been trained by the World Bank to use STEP, and others will be trained as and when required.

12.10 Procurement Review thresholds

The procurement thresholds for the various procurement methods to be used by the project is given in Table 12.2.

Table 12.2 Procurement Thresholds for the Various Procurement Methods

Procurement Type	Market Approach method Threshold (US\$, millions)	World Bank's Prior Review Threshold (US\$ millions)
Works	Open International: More than 40 Open National: up to 40 National RFQ: up to 0.1	All contracts > 15
Goods, IT, and non-consulting services	Open International: More than 10 Open National: up to 10 National RFQ: up to 0.1	Goods and IT: All contracts > 4 Non-consulting services: All contracts > 4
Consulting firms	Open International: More than 2 National market approach < 2 CQS < 0.3 LCS, FBS - in Justified cases QCBS, QBS - in all other packages	All contracts > 2
Individual consultants	No thresholds	All contracts > 0.4
DS	No thresholds	With prior agreement based on justification For goods/works /non-consulting services: According to paragraphs 6.8-6.10 of the Procurement Regulations For consultants: According to paragraphs 7.13-7.15 of the Procurement Regulations

12.11 Advance Contracting with Retroactive Financing

For effective project implementation and effective start-up, the project has initiated advance contracting, which is likely to include, but may not be limited to, critical consultancies envisaged under the project.

12.12 Post Review

All contracts not subject to prior review by the World Bank will be subject to post review. Post review of the sampled procurements would be carried out during the project's implementation support missions and/or special post review missions. The World Bank may conduct, at any time, independent procurement reviews of all the contracts financed under the loan.

12.13 Complaint handling mechanism

To address procurement complaints received by the project, a link disclosing details about the complaint handling mechanism for this project will be given on the IAs' website. The mechanism would include a brief on whom to complain to, how it will be resolved, and what will be the estimated timeline. The IAs are also required to ensure recording of procurement-related complaints in the

STEP tool. Both the World Bank and the borrower will use STEP to track complaints. The borrower will be responsible for performing the following actions in STEP:

- (i) Promptly record all complaints relating to procurement process in IPF operations;
- (ii) For procurement process complaints received on contracts subject to the World Bank's prior review, submit the borrower's proposed response to each complaint before issuing it to the complainant(s);
- (iii) Record the borrower's response to the procurement process complaints upon issuance to the complainant(s); and
- (iv) Promptly register requests for debriefings and update STEP with the record of the debriefings to interested parties.

12.14 Record keeping.

All records pertaining to award of contracts—including bid notifications; bidding documents; bid opening minutes; bid evaluation reports; signed contracts; and all correspondence pertaining to bid evaluation, communication exchanged with the World Bank and the bidders/consultants in the process, bid securities, and approval of invitation/evaluation of bids—must be retained by the PIUs. These will also be uploaded in STEP.

12.15 Disclosure

The minimum documents that will be disclosed on the IAs' website include: RFB/Request for Expressions of Interest and (b) details of contract awards. The following details are published on the United Nations Development Business website through STEP:

- (i) An invitation for bids for procurement of goods and works using open international procedures; and
- (ii) Contract award details of all procurement of goods and works using open international procedures.

13 ENVIRONMENTAL AND SOCIAL FRAMEWORK

13.1 Background

The project will promote more resource-efficient, inclusive, and diversified growth in the rural sector and enhances competitiveness and enables job creation. The Project is also aligned to transform by increasing agricultural productivity in targeted areas, improving incomes of small and marginal farmers, and contributing directly to ending extreme poverty and promoting shared prosperity. The Project will also aim to leverage private sector investments by enabling access to finance and building market access. The activities will support gender equality and empowerment through targeted training of women in modern agricultural, horticultural and fishery methods, as well as by encouraging female plot holders to take up an active role in Water User Associations (WUAs), and thus in the planning, implementation and management of minor irrigation schemes supported by the project.

13.2 Project Benefits and Beneficiaries

The Project is expected to yield significant and lasting benefits for vulnerable farmers in West Bengal. It is estimated that about 165,000 farmers would benefit directly, resulting from extension of irrigation that allows intensification of agricultural activity and expansion of ponds for fishery. Farmer benefits in terms of higher incomes will thus stem from higher crop yields; more diversified, higher value crops; newly established fishponds; and better market access and product marketing. In addition, cost savings will be realized with the use of solar based pumping and by adopting water efficiency technologies, such as sprinkler and drip irrigation. Nonmonetary benefits include community empowerment to be realized through WUAs. The vulnerable farmers—including those who are small and marginal, belong to tribal communities, and are women (20%)—will be specifically targeted, through project area selection that would account for level of water stress, prevalence of single cropped, rainfed farms, and socio-economic factors.

It is estimated that the Project will reach 85 percent of small and marginal farmers and 11 percent of tribal farmers in the State. By implementing the Project, the DWRID will benefit by gaining enhanced capacity to deliver minor irrigation services through collaboration with communities and internalizing GIS, remote sensing, and other technology advances.

13.3 Environmental and Social Management Framework (ESMF)

The Project has prepared the Environmental and Social Management Framework (ESMF) that provides guidance to preparing specific subprojects. It lays out processes to screen, identify, assess, mitigate, and minimize any risk, such as exclusion of marginalized communities and adverse impact on the community and environment for 'yet to be identified' subprojects. The ESMF includes template Environmental and Social Management Plans (ESMPs), which would be updated with subproject-specific ESMPs as part of the assessment carried out during the preparation of subprojects. Further, the ESMF addresses occupational and community health safety and implementation arrangements for managing E&S issues and the GRM. To address the requirements of Environmental and Social Standards 2 (Labor and Working Conditions), a Labor Management Procedure has been prepared. Owing to Phase I, the institutional arrangements for E&S management measures are already in place, although district-level environment professionals need to be onboarded. An Environment and Social Commitment Plan (ESCP) and a Stakeholder Engagement Plan have been prepared. The ESCP records the requirements for preparing any subproject-level instruments that may be needed as per the ESF.

13.4 Stake Holder Engagement Plan

The Environmental and Social Standards (ESS) 10, “Stakeholder Engagement and Information Disclosure”, recognizes “the importance of open and transparent engagement between the Borrower and project stakeholders as an essential element of good international practice” (World Bank, 2017: 97). The stakeholder engagement plan is published in the project website.

The Project will engage with multiple and varied set of stakeholders for different activities under the project components. The main objectives of the SEP are to adopt a systematic, transparent and participatory approach to stakeholder engagement and information disclosure, and maintenance of positive stakeholder relationships, monitoring of stakeholder feedback and implementation of an accessible and responsive grievance redressal mechanism. The SEP also aims to facilitate stakeholder feedback and engagement on project design and implementation, including on identification and mitigation of environmental and social risks and impacts. The SEP will take into account the existing institutional and regulatory frameworks/acts of the Government of India (GOI) and the Government of West Bengal (GoWB) as well as the requirements of the Environmental and Social Framework (ESF), 2016 of World Bank.

The SEP will include multiple channels and mechanisms of engaging with the stakeholders, including Publications, website, telephone, public consultations and meetings, participatory assessments and surveys, participatory planning and existing channels of citizen’s engagement of the GoWB. Differentiated measures will be adopted to engage with vulnerable and disadvantaged households, including focus group discussions, inclusive beneficiary identification in the sub projects, inclusion amongst beneficiary groups, and lower thresholds for cost sharing for individual benefits. Other project-related information will be shared with the primary stakeholders in locally understood languages where necessary. All ESS plans and documents will be disclosed on the project’s websites.

13.5 Environmental and Social Commitment Plan (ESCP)

The Government of India will implement the West Bengal Accelerated Development of Minor Irrigation Project Phase II Project (the Project), with the involvement of the Department of Water Resource Investigation and Development (DWRID), Government of West Bengal, , as set out in the Loan Agreement. The International Bank for Reconstruction and Development (the World Bank/Bank) [, acting as the] [administrator/implementing agency/accredited entity/implementing entity/other] [of] [name the trust fund], has agreed to provide [the original] financing [(P177876)] for the Project, as set out in the referred agreement(s).

The Government of India shall ensure that the Project is carried out in accordance with the Environmental and Social Standards (ESSs) and this Environmental and Social Commitment Plan (ESCP), in a manner acceptable to the [World Bank/Bank/Association]. The ESCP is a part of the Loan Agreement. Unless otherwise defined in this ESCP, capitalized terms used in this ESCP have the meanings ascribed to them in the referred agreement(s).

Without limitation to the foregoing, this ESCP sets out material measures and actions that the Government of India shall carry out or cause to be carried out, including, as applicable, the timeframes of the actions and measures, institutional, staffing, training, monitoring and reporting arrangements, and grievance management. The ESCP also sets out the environmental and social (E&S) instruments that shall be adopted and implemented under the Project, all of which shall be subject to prior consultation and disclosure, consistent with the ESS, and in form and substance, and in a manner acceptable to the World

Bank/Bank/Association]. Once adopted, said E&S instruments may be revised from time to time with priorwritten agreement by the [World Bank/Bank/Association].

As agreed by the World Bank and the [Borrower/Recipient], this ESCP will be revised from time to time if necessary, during Project implementation, to reflect adaptive management of Project changes and unforeseen circumstances or in response to Project performance. In such circumstances, the [Borrower/Recipient] [through] [name of the Project Implementing Entity, ministry or agency] and the [WorldBank/Bank/Association] agree to update the ESCP to reflect these changes through an exchange of letters signed between the World Bank and the Government of West Bengal [Principal Secretary,] of Department of Water Resource Investigation and Development (DWRID), Government of West Bengal. The [DWRID, Government of West Bengal] shall promptly disclose the updated ESCP.

13.6 Climate Adaptation and Mitigation

A summary of climate adaptation and mitigation activities embedded in project design is provided in the Climate Change Technical Note. Climate change considerations have been mainstreamed in the Project and will directly contribute to improving access to irrigation, enhancing management of water resources, and augmenting production of agricultural commodities in the project areas. The Project will help West Bengal to attain its 2030 vision of becoming a carbon-neutral state and enable the GoWB to better adapt to the impacts of climate change by building the knowledge base and decision-support systems for climate-resilient planning and investment. The investments included in the Project will also directly contribute to the institutional and infrastructure capacity to mitigate the impacts of climate change, through improved water security and enhanced agricultural productivity.

14 GRIEVANCE REDRESS MECHANISM

The Project will establish a Grievance Redress Mechanism (GRM) with the aim to respond to queries or clarifications or complaints about the project and address complaints/concerns and grievances of the stakeholders. The GRM will focus on corrective actions that can be implemented quickly and at a relatively low cost to resolve identified implementation concerns, GRM will also serve as a channel for early warning, helping to target supervision to where it is most needed and identify systemic issues.

14.1 Institutional Arrangement

The institutional arrangement for the GRM will be established on the following lines. The grievance redress mechanism should be in place to identify Schemes and WUA and civil construction activities in the area. A platform for grievance redressal should be organized, and regular meetings may be conducted to allow people to express their grievances. It will help the appropriate authority find solutions and amicably address the issues. The project, apart from the web-based mechanism, will have a three-tier grievance redressal mechanism, i.e., (1) at the project site level (up to DPMU level), (2) State level (SPMU level) and (3) at the Judiciary level.

14.1.1 Web Based Grievance Mechanism

In case of grievances received through a **toll-free number 033 1800 345 8888** or web-based system www.wbadmip.org/grievences, a person will be made in charge of screening and resolution of the same/communicating with the concerned divisions for resolution of the same. Based on the nature of the complaint, the person in charge will forward the same to the concerned official. A ticket or a unique number will be generated for all such complaints. The complainant will follow up based on that unique number. The system will also record anonymous complaint. All calls and messages will be responded to within two weeks. If a response is not received within 15 days, the complaint will be escalated to the project head.

- Tier I: If the aggrieved person is not satisfied with the verdict of the local level grievance cell, they can escalate the grievance to the district level grievance cell. The tier I cell will be under the Chairmanship of the Executive Engineer. The other members will include the Institutional Development specialist and Environmental Specialist at district level. The grievance cell will provide its view within 30 days of receiving the grievance.
- Tier II: If not satisfied with the verdict given by the district grievance cell, the aggrieved person will have the right to approach the State level Mechanism. The tier II cell will be under the Chairmanship of the Additional Project Director WBADMIP. The other members will include the Environmental Specialist and Institutional Development Coordinator of the SPMU. The second level of the grievance cell will provide its view within 30 days of receiving the grievance.

If not satisfied with the verdict given by State level grievance cell, the aggrieved person will have the right to approach the Judiciary. The project will help the aggrieved person if a person wants to approach the judiciary.

14.1.2 State Government Portal.

The state government has its own grievance portal which is managed and monitored by the office of Chief Minister. Apart from the web site (cmo.wb.gov.in) where one can also register the grievance through email (wbcmro@gmail.com), SMS (9073300524) and a Toll-Free number (18003458244).

14.1.3 Project specific Portal

Project will maintain a portal with dedicated mechanisms for receiving stakeholder grievances. All grievances, feedback and queries received through the project portal will be collated and compiled by the State Social Expert and included in the progress report. The portal will also provide relevant information on the multiple channels that can be used for submitting grievances to the project. **Toll-free number 1800 345 8888** email ID grevience.wbadmip@gmail.com and web-based system www.wbadmip.org/greviences

14.1.4 Grievance Registers.

Grievance Registers will be maintained at District/sub project levels to record, track and report on the inflow of stakeholder grievances, enquiries and feedback. The Grievance Registers will help with monitoring and evaluation of the functioning of GRMS.

14.2 Grievance Process.

All grievances, enquiries and feedback received through the multiple channels will be tracked through a grievance log that would be maintained through the MIS. Grievances will be directed to the competent nodal grievance officer at the state, district, and block levels for resolution, with recommended timelines. The concerned Grievance Officer will be responding to the grievance/query through phone calls, meetings and letters, in order to resolve the issues. If needed site visits will be undertaken to appraise the exact nature of the stakeholder concerns. The Complainant will be made part of the grievance resolution process and kept updated of the resolution process through phone calls and formal letters. Information material on GRM will also inform the stakeholders about grievance escalation hierarchy that would help the complainant to escalate any unresolved issues to higher level officers, as well as the existing state level GRM channels of government portal and grievance committee chaired by the district collectors. The grievance redress process will be a continuous, transparent and participatory process that would be an integral part of the project's accountability and governance agenda.

14.3 GRM Monitoring and Reporting

The functioning of the GRM will be monitored by the IDS of SPMU and the PD. Status and function of the GRM will be documented and shared by the IDS of SPMU through quarterly reports and review meetings. GRMs will also be tracked through the project MIS. GRM Review Meetings will held every three months chaired by the PD and convened by the IDS of SPMU. The IDS will be responsible for presenting status of all matters/ grievances received during the last quarter/month, and the action taken to resolve them. The GRM mechanism will be notified to the public and stakeholders within 6 months of project effectiveness. The project website will be posting the status of the GRM every month on the website of the project.

14.4 Assistance for aggrieved persons belonging to vulnerable groups for accessing legal recourse

If an aggrieved person is not satisfied with the results of grievance redress by the project grievance redress mechanism, such a person can approach the Courts, under the laws of the Country, and the verdicts of the Courts will be final, as per the judicial processes established in India. In general, the legal system is accessible to all such aggrieved persons. However, there might be cases where vulnerable sections face hurdles in accessing the legal recourse system. These hurdles usually include the cost of litigation, knowledge about the legal system, or the lack of awareness about formal legal procedures. To help citizens to access the legal recourse system, each State has an operational mechanism called the Legal Aid Centre, which provides free services including services of lawyers without any cost to the litigants. The IDS of SPMU will engage with State legal Aid Centre to provide such services to the aggrieved persons. As part of the partnership, the project will reimburse all additional costs that accrue to the State Legal Aid Centres. This facilitation will be available to the aggrieved person(s) if they fulfil the following

two conditions: (1) that such aggrieved person(s) belong to any of the following vulnerable sections of the society - below poverty line families, scheduled castes, scheduled tribes; or is disabled, women headed households; and (2) such a person or persons those who have exhausted the provisions of GRM.

14.5 Grievance mechanism for SEA/SH:

Though the risk of SEA/SH is low in the project, in case of any such incident the Institutional Development Specialist of SPMU will be the first level of contact. The IDS will be specially trained for handling SEA/SH related grievances. The IDS in turn will inform the Project Director. The IDS will get in touch with the service provider / all women police station in the district for necessary support to the victim. The name and cell phonenumber of IDS will be displayed in all work sites especially at check dam sites.

15 ATTACHMENTS

In the separate document PIP WBADMIP Phase-II / Part-2 Attachments

16 FOR MORE DETAILS

Website

www.wbadmip.org

Email ID

greviences.wbadmip@gmail.com

Toll Free No

1800 345 8888

“Krishikatha” Mobile based Advisory Service

Missed Call service

033 6811 6666

Office of the Project Director, WBADMIP
5th Floor, ICMARD Building, Block- 14/2, CIT Scheme-VIII (M), Ulta Danga,
Kolkata-700 067, Telephone- +91-33-23567548/49 www.wbadmip.org