

PC - I FORM (Revised 2005)
PRODUCTION SECTORS
(Agriculture Production)

**National Program for Enhancing Command Area of Small
and Mini Dams in Barani Areas of Pakistan**

(The Punjab Component)

Total Project Cost:	Rs. 3,712.642 Million
Government Share:	Rs. 2,535.802 Million
Farmers Contribution:	Rs. 1,176.840 Million



(2019-20 to 2023-24)

**DIRECTORATE GENERAL
AGRICULTURE (WATER
MANAGEMENT) PUNJAB, LAHORE**

April, 2019

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ABBREVIATIONS AND ACRONYMS

ADP	Annual Development Program
ABAD	Agency for Barani Areas Development
CSC	Consultant Selection Committee
DGA(WM)	Director General Agriculture (Water Management)
DIC	District Implementation Committee
DRC	District Rate Committee
ERR	Economic Rate of Return
FCR	Final Completion Report
GDP	Gross Domestic Product
GIS	Geographic Information System
HEIS	High Efficiency Irrigation System
ICR-I	First Intermediate Completion Report
ICR-II	Second Intermediate Completion Report
IRR	Internal Rate of Return
M&E	Monitoring and Evaluation
MAF	Million Acre Feet
NPIW	National Program for Improvement of Watercourses
OFWM	On Farm Water Management
P&DD	Planning and Development Department
PD	Project Director
PIC	Project Implementation Committee
PIPIP	Punjab Irrigated-Agriculture Productivity Improvement Project
PPC	Project Policy Committee
PQC	Prequalification Committee
PSC	Provincial Steering Committee
SSCs	Supply & Service Companies
WMO	Water Management Officer
WMRF	Water Management Research Farm
WMTI	Water Management Training Institute
WUAs	Water Users Associations

1. NAME OF THE PROJECT

National Program for Enhancing Command Area of Small and Mini Dams in Barani Areas of Pakistan (the Punjab Component)

2. LOCATION

The proposed project will be implemented in rainfed areas of the Punjab province including Attock, Rawalpindi, Chakwal, Jhelum, Gujrat, Sialkot, Narowal, Khushab, Mianwali, Bhakkar, Layyah, Dera Ghazi Khan and Rajanpur districts. The map of the project area is enclosed (**Annexure-A**).

3. AUTHORITIES RESPONSIBLE FOR

a) Sponsoring

1. Ministry of National Food Security & Research, Government of Pakistan through Public Sector Development Program
2. Government of the Punjab, Agriculture Department through Annual Development Program

b) Execution

1. Ministry of National Food Security & Research through Federal Water Management Cell
2. Agriculture Department through;
 - i. Directorate General Agriculture (Water Management) Punjab, Lahore
 - ii. Directorate General Agriculture (Ext. & A.R) Punjab, Lahore
 - iii. Agency for Barani Areas Development (ABAD)/ Directorate of Soil Conservation, Rawalpindi
3. Supply & Service Companies (SSCs)/ Supplier firms
4. Project Consultants
5. Participating Farmers/ Water Users Associations (WUAs)

c) Monitoring

1. Federal Water Management Cell
2. Directorate General Agriculture (Water Management) Punjab
 - i. Directors Agriculture (OFWM)
 - ii. Deputy Directors Agriculture (OFWM)
3. Directorate General Agriculture (Ext. & A.R) Punjab, Lahore
4. Agency for Barani Areas Development (ABAD)/ Directorate of Soil Conservation, Rawalpindi

d) Operation and Maintenance

Participating Farmers/ Water Users Associations (WUAs)/ LASER land leveling service providers/ supply & service companies

e) Concerned Federal Ministry

Ministry of National Food Security & Research, Government of Pakistan, Islamabad.

4. PLAN PROVISION

i) If the project is included in the medium term/ five-year plan, specify actual allocation

The proposed project is in line with the Medium Term Development Framework (MTDF) of Planning and Development Department (P&DD), Government of the Punjab, which envisages “efficient water conveyance and application through improved watercourses and precision land levelling” as one of objectives/policy of the agriculture sector. Moreover, the Punjab Growth Strategy (PGS) envisages the On Farm Water Management (OFWM) as one of the components for achieving the targeted agricultural growth, which would be achieved through water conservation at the farm level by improvement/ rehabilitation of watercourses and adoption of modern irrigation technologies such as LASER land leveling. In addition, Agriculture Sectoral Plan equally envisions that water management at farm level is critical for enhancing the crop productivity.

At the national level, the proposed project is well aligned with the provisions of Pakistan Vision 2025 of the Ministry of Planning, Development and Reforms, Government of Pakistan, which recognizes sufficient, reliable, clean and cost-effective availability of energy & water for ensuring sustainable economic growth and development. It has been envisaged therein that Pakistan needs a comprehensive water strategy that must combine the building of a substantial amount of additional water storage, minimization of losses in the conveyance system, and strengthening of the governance to implement effective policies to maximize crop yields per unit of water. It has also been planned in Pakistan Vision 2025 to "*invest in proven methods and technologies to minimize water wastage (e.g. in the agricultural sector), promote conservation and gain efficiencies through rationalization of pricing*".

ii) If not included in the current plan, what warrants its inclusion and how is it now proposed to be accommodated

Not applicable.

iii) If the project is proposed to be financed out of block provision, indicate amount proposed for the project and provision in current year PSDP/ADP

Not applicable.

5. **PROJECT OBJECTIVES**

5.1 **Sectoral objectives as indicated in the medium term/ five year plan be reproduced**

The strategies for conservation of water contained in the Punjab Growth Strategy (PGS), 2018 (page-73) includes the followings.

- ◆ ***Water conservation above farm level through improvement and rehabilitation of watercourses***

The National Water Policy envisages that the concept of "*More Crop per Drop*" shall be pursued through investment in conservation measures like HEIS projects, lining of distributaries, minors and watercourses to improve conveyance efficiency". Similarly, National Climate Change Policy described the "*Improve irrigation practices by adopting, wherever feasible, modern techniques such as the use of sprinklers and trickle irrigation*". Likewise, the Punjab Agriculture Sectoral Plan (PASP), 2015 at page-46 envisages to adopt a holistic approach focusing on all three elements of improving water efficiency including conveyance, application and water use efficiency through watercourse improvement, LASER land leveling and promotion of other OFWM interventions. As such, the project activities are completely inline with the sectoral objectives outlined in the PGS and PASP.

5.2 **Project Objectives**

The overall objective of the proposed project is to promote an environment friendly, socially sustainable, resource efficient, and economically profitable irrigated agriculture in rainfed areas through integrated development and management of available water resources by strengthening small landholder's resilience to the climate change. The overall development objective of this component would be to enhance agricultural productivity vis-à-vis water productivity. The key objectives would include, inter alia, the followings.

- i. *Enhance crop productivity through developing the land and water resources using modern irrigation methods/ techniques*
- ii. *Developing the command of small/ mini dams for promoting irrigated agriculture*
- iii. *Promote cultivation of high value cash crops using efficient irrigation and agricultural practices for enhancing water productivity to cope with the effects of climate change*
- iv. *Build capacity of farmers to adjust with changing environment and for practicing resource efficient and profitable irrigated agriculture*
- v. *Increase farm income/profitability of small land holder's to improve livelihoods*

vi. Create job opportunities in rural areas by introducing high value irrigated agriculture

vii. Promotion of fruit crops, oilseeds/pulses and fodder in the barani areas

5.3 Sectoral Linkages/Relationship

The proposed project has strong relationship with all the strategy and growth documents of Government of the Punjab. It is in line with the Medium Term Development Framework (MTDF) of the Planning and Development Department (P&DD), Government of the Punjab, which envisages efficient water conveyance and its application through rehabilitation/improvement of farm level water infrastructure and adoption of improved irrigation methods e.g. drip and sprinkler irrigation, etc. The Punjab Growth Strategy envisages the On-Farm Water Management (OFWM) as one of components for achieving the targeted agriculture growth, which would be achieved through water conservation at farm level through construction of water storage ponds, development of dugwells, improvement of watercourses in the command area of small dams/ mini dams of barani areas of the Punjab, installation of solar pumping systems at farm ponds and dugwells, provision of LASER land levelers. In addition, the Agriculture Department sectoral plan encompasses that the water management at the farm level is critical for enhancing the crop and water productivity.

6. DESCRIPTION AND JUSTIFICATION OF THE PROJECT

6.1 Background

Agriculture sector of developing countries being major user of available water supplies, Pakistan being no exception, has become more vulnerable to the climate change phenomenon owing to their geographic, climatic, and economic settings. Climate change is emerging as one of the major challenges for agricultural production, particularly in the context of water resources management and water use. The World Bank has listed Pakistan in 12 highly exposed countries to the climate change. Within the agriculture, the rainfed farming would be more impacted by climate variabilities as crop production is directly influenced by precipitation and temperature, which are the most critical crop production functions. According to recent study by the World Wildlife Fund (WWF) and International Development Research Center (IDRC), if present trend continues climate change may reduce the agricultural productivity by around 8-10% by 2040 costing to about Rs. 30,000/acre.

The barani areas of the province mainly comprise of Pothohar region, hill torrents of Rod Kohi region of Dera Ghazi Khan and Rajan Pur districts and Thal area. The Pothohar is lying between Indus and Jhelum rivers having a total area of about 5.4 million acres (2.2 million

hectares), is highly vulnerable to such climatic variations but has a huge untapped land and water resources potential for development of irrigated agriculture. At present, out of total 5.4 million acres, about 86,000 acres (35,000 hectares) are being irrigated by existing water resources. The major challenge for development of irrigated agriculture in this area is non-availability of irrigation water, being the most critical input for crop production. Unlike irrigated areas of the Punjab, agricultural development in rainfed areas is mainly dependent on rainfall, which is highly erratic in spatial and temporal terms generating about 3.5 MAF water per annum on an average, which is lost as surface runoff, causing soil erosion and land degradation in these areas.

Hill torrents (Rod Kohi) region of Dera Ghazi Khan and Rajan Pur districts in Punjab is another area to harness potential of water and land resources. Similarly, Thal area of the Punjab is also lying barren/ uncultivated despite shallow groundwater. This area can be improved by introducing OFWM interventions for development of the integrated farming system. Riverine marginal lands also have a tremendous potential of agricultural development. Non-development of irrigated agriculture is a major concern regarding poor crop production, accelerated rainfall run-off losses, land degradation and rural poverty in rainfed areas.

The most appropriate measure for increasing the water productivity at the farm level would be to conserve maximum of available runoff water generated by rains, wherever possible through development of water storage ponds or other such intervention and then using it for supplemental irrigation of water sensitive crops. The climatic conditions, soils, and water resources in the project area provide enormous opportunities for growing high value and cash crops like orchards (citrus, olive, grapes, stone fruits), vegetables (cucumber, capsicum, chilies, onion, tomato, potato, garlic etc.), groundnut, pulses, mustard, sesame etc. Therefore, enormous scope exists for development of irrigated agriculture in barani (rainfed) areas by effective water resources development and its efficient management.

The proposed project envisions promoting an environment friendly, socially sustainable, resource efficient, and economically profitable irrigated agriculture through integrated management of available soil and water resources by strengthening small landholder farmers. It would be achieved through increased water conveyance and application efficiency, adopting improved irrigation methods, use of solar energy for water lifting/ HEIS operation for promoting crop diversification, effective use of costly inputs, and capacity building of water users in the project area.

6.2 Project Approach

Emerging climate change and food security for the ever-increasing population demands productive farming systems resilient to risks, shocks and long-term climatic variabilities. This necessitates a paradigm shift in a way that major crop production inputs e.g. land and water are managed to ensure their efficient, smart and sustainable use. Although, there has been a rapid uptake of the term ‘climate smart agriculture (CSA)’ by the international community, national entities and local institutions, but there is no blueprint available for CSA as its precise nature varies spatially influenced by numerous factors such as climatology, topography, crops grown, available technologies, knowledge and skills of individual farmers etc. Increasing agricultural productivity and incomes in a sustainable way alongwith adapting and building resilience to the climate change are, however, the key elements of such agriculture.

The proposed project would entail development of water sources and improve water conveyance and application efficiencies through water management interventions. These activities would be carried out in conjunction with construction of water storage ponds, development of dugwells, improvement of water conveyance system, installation of solar systems for water lifting/ HEIS operation for practicing more profitable irrigated agriculture, especially high value crops as well as capacity building of the farmers. The combined effects of these interventions would contribute significantly in enhancing crop productivity, increasing farm income, improving livelihood of people, enabling farmers to adjust the agriculture practices in rainfed areas, and alleviating poverty in a sustainable manner. The conceptual layout of scope of the project is shown in **Figure-1**.

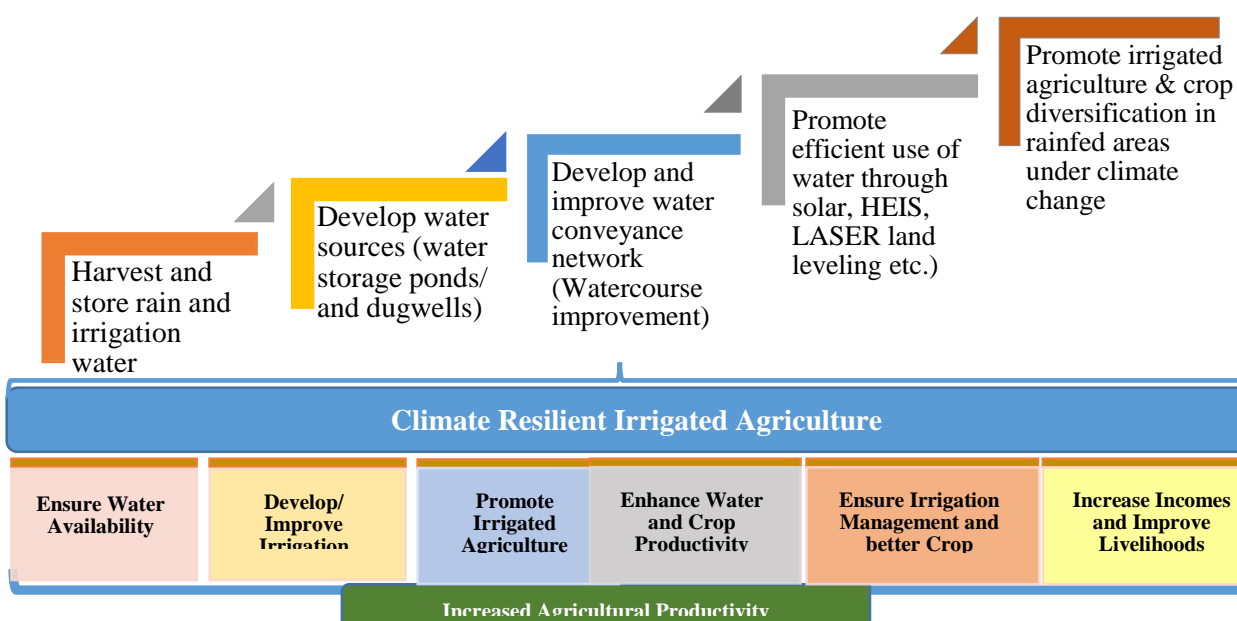


Figure-1: Conceptual Layout for Barani Areas Development/ Enhancement

6.3 Project Components

The proposed project would follow an integrated approach including development of water sources (farm ponds and dugwells) for assured supply of irrigation water, construction of farm level water distribution network (watercourses) for irrigating crops, promotion of LASER land leveling services, solar pumping systems for irrigation, capacity building of stakeholders for promotion of irrigated agriculture in the rainfed areas.

The component-wise detail of project interventions is given as under.

- 1) Construction of **480** farm ponds for storing rainwater from various sources
- 2) Installation of **480** solar pumping systems on farm ponds for operation of high efficiency irrigation systems
- 3) Development of **736** dugwells for developing of water source to promote irrigated agriculture
- 4) Installation of **736** solar pumping systems at dugwells for operation of high efficiency irrigation systems
- 5) Development/ improvement of **600** watercourses carrying water from various sources for enhancing water conveyance efficiency at farm level
- 6) Provision of **500** LASER land levelers to the farmers/ service providers for strengthening LASER land leveling services in the Barani areas
- 7) Provision of fruit plants, oilseeds/ pulses crops & fodder/ forage/ range on **6,383, 16,538** and **11,562** acres, respectively, in command area of small/ mini dams to ensure irrigated agriculture

7. PROJECT IMPLEMENTATION

A brief description of major activities to be carried out and their implementation strategies under the proposed project are given hereunder.

7.1 Construction of Farm Ponds

7.1.1 Overview

The majority of farm ponds is usually constructed for fish farming, fire protection and livestock watering, domestic use or simply landscape beautification. However, their usefulness as irrigation and watershed management tools has not been sufficiently exploited yet in Punjab's irrigated agriculture because farmers have been relying on supply based water distribution system in the canal and small/ mini dam command areas. As water supplies might be uncertain in the existing water distribution system, it is important for farmers to make more

concerted efforts to institute on-farm water storage pond in irrigated and rainfed areas of the province to improve the water security at farm level.

Farm ponds have great potential to improve agricultural water security through capturing rainfall runoff during rainy season, storing excess water from any source during times of no need, and enabling the conjunctive use of water in saline groundwater areas for irrigation of crops in the entire Punjab. Farm ponds can also serve as lifesaving water source for frost protection and provide a wide range of additional economic and environmental benefits. As such, farm ponds can be effectively applied in both irrigated and rainfed agriculture. The use of farm ponds for supply of irrigation water and regulating the streamflows are being explored in Santa Cruz of California and tailwater recovery ponds for canals are being implemented all around the state, especially in the Sacramento and San Joaquin Valleys.

The farm pond can also be considered for mitigating the climatic variabilities. Under dwindling per capita water availability, even relatively small volumes of water storage can significantly increase agricultural and economic productivity besides safeguarding domestic and livestock needs during dry periods in barani areas. Ponds are necessary in rainfed areas for various reasons including, absence of facilities for supplemental irrigation, availability of very small volume of discharge from various water sources e.g. small tubewell, dugwell etc.

In barani (rainfed) areas, ponds can be filled by diverting water directly from streams/ nallas/ springs, tubwells and dugwells etc., to regulate the discharge for surface irrigation. Ponds can also be used to trap and filter the sediments present in irrigation water to improve its quality. Water can be reused in subsequent irrigations, reducing the need to divert or pump more groundwater. Pumping from a pond uses much less energy than direct pumping of groundwater.

The capacity of water storage pond would vary depending mainly upon the geographical conditions, size of the flows, and water requirements of the area to be irrigated. The glimpses of water storage ponds are shown in **Figure-2**.

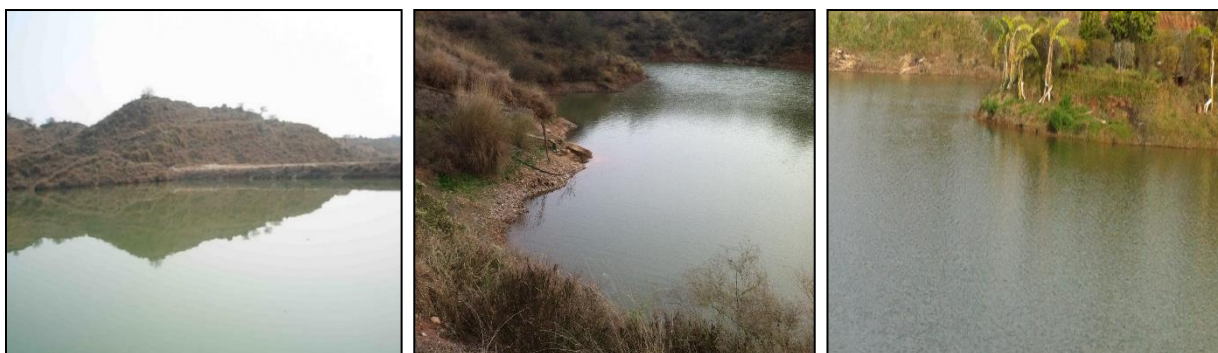


Figure-2: The Farm Pond

7.1.2 Estimation of Supply, Demand and Capacity/Size of Farm Pond

The estimation of irrigation water demand is very important to decide an optimum capacity/ size of a water storage pond/ farm pond, which is critical for obtaining the intended economic output by the intervention. The size of pond, water requirement of the crops to be grown and acreage of land to be irrigated will all determine the efficacy of ponds. The size and design capacity of the water storage pond would vary depending mainly upon the geographical conditions, size of the flows, and crop water requirements of the area to be irrigated.

Following factors would be considered while estimating the supplies/ inflows to the farm ponds for retention and subsequent supply of required irrigation water:

- i. Collection of rainfall data over the years
- ii. Runoff estimation/ analysis
- iii. Available water supplies
- iv. Average climatic data
- v. Crop and soil parameters
- vi. Irrigation method

After estimating expected inflows, the water requirements would be estimated on following basis:

- i. Command area to be irrigated
- ii. Prevalent/ proposed cropping pattern
- iii. Crop divergent water requirement
- iv. Effective rainfall amounts
- v. Crop and soil parameters for concerned agro-ecological zone
- vi. Suitable irrigation method
- vii. Divergent irrigation water requirements

Following factors would be considered for the determination of the capacity of the farm pond:

- i. Formulation of the irrigation schedules for the crops to be cultivated
- ii. Finding the design storage capacity of the farm pond based on storage operation and water balance method

Although, farm pond can accrued benefits to all sizes of farms, however, enormous impact can be harnessed on smaller acreages of intensive crops by adoption of modern irrigation methods like drip and sprinkler irrigation systems. As such, the design of WSP will be site specific where water storage capacity will depend on location, climatic conditions, rainfall, edaphic and agronomic factors.

7.1.3 Construction

There is a growing interest in rainfed areas like Pothohar, where farmers intend to move from dryland farming to irrigated agriculture. In these areas, the ponds can be constructed across a gully or natural point of concentration to intercept flows from small streams of adjoining small watersheds/ catchments that would otherwise be lost eventually after rainfall event. This practice would be adopted at those sites, which do not develop high flows during intensive rains to ensure the safety of the water storage pond. Spillways and bypasses would be provided for removing water during peak flows. Following factors would be considered for the construction of pond in rainfed areas:

i. Topography

Topography determines the type and location of the pond. Sloping topography allow the farmers to fill or drain ponds using gravity. It will also determine whether the water storage pond would be above or below the ground level of the cultivated area.

ii. Location

The pond would typically be constructed on an area within the farm that is less productive, such as a low-lying area, and water will accumulate in the pond flowing freely from the watershed. Pond should be located at that part of the farm/ catchment where it requires minimum pumping head or even water can flow freely from the pond to the cultivated land under the action of gravity, unless it is unavoidable that water is required to be pumped to a higher elevation for its use. The topographic survey would indicate correct elevations to optimize flow into the pond.

iii. Soil

Ponding bodies do not function well on sandy or highly porous soils. The earthen ponds should be as impermeable as possible to prevent leakages and spills. The bottom soils should be impervious and thick enough to prevent excessive seepage. Clayey to silty clay soils are considered excellent for this purpose. However, sandy clays can also be considered for construction of pond after necessary compaction/ lining. As the coarse-textured sands and sand-gravel mixtures are highly pervious, therefore, these are considered unsuitable for construction of earthen water storage ponds. Absence of a layer of impervious material over part of the ponded area does not necessarily mean that the proposed site would be abandoned. In such cases the pond would be sealed in other ways like dressing/ compacting/ lining etc.

iv. Pond Components

The pond mainly consists of following four (4) components:

- the inlet works
- the side walls (dikes or levees)
- the bottom floor and:
- the outlet works

In case of elevated pond, walls have to be nearly impermeable and capable of withstanding the pressure exerted outward by the pond. The floor must be as nearly impermeable as possible. The inlet structures should be able to receive expected amount of water/ inflow. The outlet/ orifice should have the ability to regulate flow from the pond and provided with a spillway/ overflow structure for the removal of excess water during high flows. Soils should be well compacted/ dressed to ensure that leakage is held to minimum and seepage is reduced. A desilting pond may be provided at inlet for removal of sediment before the water enters the storage pond.

7.1.4 Potential Benefits

- More localized water buffering source
- Virgin lands can be brought under irrigation
- Caters peak water demands during dry periods
- Ensures lifesaving source for uninterrupted physiological growth of the crops
- Smooths out variations in water supplies to provide water security at the farm
- Cropping intensity would be increased
- Enables to grow water sensitive and high value crops sustainably
- Reduces energy use against groundwater pumping
- Controls downstream land degradation caused by the peak flows
- Reduces vulnerability to drought and seasonal variations in rainfall
- Improves water quality of saline groundwater
- Facilitates freeze protection to crops
- Farm income is increased substantially

The development of farm ponds under the proposed project offers massive opportunities for localized water resource development as these are one of the most reliable and economical source of water in barani areas. These would serve a variety of purposes like irrigation, groundwater recharge over a large area, supplementing domestic water supply/ livestock, erosion control, recreation, landscape improvement etc. The construction of about **480** farm

ponds has been planned under the project for irrigation of crops through efficient irrigation methods like drip and sprinkler irrigation systems.

7.1.4 Selection Criteria for Construction of Farm Pond

The farmers having farms with sufficient water available to be stored would be provided financial support for construction of pond to create a reliable water source for supplemental irrigation of crops. The selection of farmers for construction of pond will be made on uniform and transparent criteria approved under the project as proposed below:

The applicant:

- a) has agricultural land in command of small/ mini dam or outside the canal command area.
- b) owns technically feasible site based on surveys.
- c) agrees to use stored water for irrigation purpose (preferably through drip and sprinkler irrigation) and would not use it for other purposes.
- d) is willing to contribute his share as per approved cost sharing formula.
- e) is not a defaulter of any government financial institution.
- f) agrees to abide by the decisions of the Project Implementation Committee (PIC) or the authorized representative of the department and will not challenge the same in any court of law.
- g) is willing to pay back full cost of government share in case he/she violates any of terms and the conditions.
- h) agrees that he/she will be fully responsible for aftercare/ successful operation of the intervention and there will be no responsibility on the department for any damage once the site is commissioned.
- i) undertakes to rectify any damage, which might hinders the usefulness of the intervention regarding irrigation of crops.

7.1.5 Cost Sharing Arrangements

The paying capacity of the farming community in rainfed areas is very poor. It is, therefore, difficult for them to mobilize the requisite resources for any new development even on developing farm infrastructure. A farmer-friendly cost sharing mechanism already adopted under previous OFWM projects and ongoing PIP- Revised project has, therefore, been proposed to be adopted for envisaged project interventions.

The cost sharing formula for construction of farm pond envisages that the government will provide a maximum amount of Rs. 720,000 if the cost of pond construction exceeds Rs. 1.2 million while, the government will provide 60 percent of the cost when the total cost of

pond construction is less than Rs. 1.2 million. The remaining cost, approximately 40 percent, will be borne by the beneficiary farmer. The unit cost breakup of farm pond is enclosed (**Annexure-B**).

7.1.6 Implementation Arrangements

The procedure for mobilizing and motivating the farmers for construction of pond would be same as that of watercourse improvement or installation of HEIS under the ongoing PIPIP-Revised project. The field staff in the respective tehsil will carry out requisite engineering survey of the site, prepare design, and cost estimates in consultation with the farmers/ WUA. The same will be checked and verified by the project consultants. The farmer will carry out all the construction works of farm pond under the technical supervision of OFWM staff. The ABAD/ Directorate Soil Conservation will carry out these activities by adopting same procedure.

Following implementation procedure will be adopted for construction of farm ponds in the project area.

- i. Design and cost estimates of water storage pond will be prepared by the OFWM staff, which will be approved by the project consultants
- ii. The rates of excavation, construction materials will be fixed by the relevant District Rate Committee (DRC)
- iii. The farmer will arrange all required materials and labour at site for excavation and construction of farm pond as per approved design and standards & specifications
- iv. The works will be verified by the project consultants

On receipt of verification report, the government share of the approved costs will be released to the farmer by the Director General Agriculture (WM)/ Project Director (PD) in three installments on recommendations of the project consultants as per following criteria:

First Installment

Release of 50 percent of the government share for development/ construction costs on receipt of verified First Intermediate Completion Report (ICR-I) from the consultants certifying following requirements.

- ◆ Design and cost estimates have been approved
- ◆ Approval/ work order has been issued by the competent authority
- ◆ Earthen works has completed as per approved standard & specifications

Second Installment

Release of 40 percent of the government share after verification of Second Intermediate Completion Report (ICR-II) certifying the followings.

- ◆ Completion of all planned works
- ◆ Rectification of shortfalls, if any

Third Installment

Release of remaining 10 percent of the remaining government share on receipt of Final Completion Report (FCR) from consultants certifying following.

- ◆ The work order has been issued for installation of HEIS at the pond site for efficient utilization of stored water

7.2 Development of Dugwells

A dugwell is an ancient water source intervention used by humans for thousand years ago. It is useful for the area where underground water is not available for installation of tubewells. Persian wheels, operated by draught animals, were very popular in distant past and equally successful in rainfed areas e.g. Pothohar area (**Figure-3**). These wells usually provide discharge of 3-5 liters per second, which was used to irrigate 3-5 acres of land for wheat, vegetables and fodder crops, which was a sustainable source for livelihood. Now the draught animals have been replaced with the diesel engines, electric motors and wheels with pumps.

The average rainfall in the Punjab is about 400 mm per annum and rainfall in the Pothohar area ranges from 400 to 1,200 mm per annum, which is sufficient water source to recharge the dugwells. Recharge rate would vary from place to place in the rainfed areas due to many factors like location of dugwell, soil type, land slope, water reservoirs near well, streams and land conservation & tillage practices.



Figure-3: The Dugwell

Percolation dugwells have large potential in Pothohar area because their recharging rate is increasing due to construction of small dams, mini dams and ponds in the area. Perennial flow nullas are also good source to recharge the dugwells constructed at lower reaches. When irrigation system is designed at higher discharge rate than lower recharge rate of the dugwell, it will exhaust after few hours of pumping. It will depend upon the recharge rate i.e. the time required to refill the depleted water level is refilled. It is, therefore, imperative to understand recharging mechanism of dugwell before designing any irrigation system on it. Suitable discharge with discharge regulator needs to be designed to maintain equilibrium between inflow and outflow of the dugwells.

Depth of dugwells depends upon subsoil geo formations and potential hydraulic gradient, which varies from 20 to 80 ft in Pothohar area. Dugwells deeper than this limit are not feasible/ safe based on stability and abstraction of water. Most of the dugwells have 12 ft diameter.

Once dugwell location is determined, a test hole may be drilled to obtain more detailed information about the depth of water producing zone, production capacity, water level and groundwater quality. Dugwells can be excavated manually by shovels and mechanically by backhoe. All types of soil formations ranging from soft ordinary soil to hard rocks are found during excavation of dugwell. Normally well curb is placed at a depth of 10-15 ft from ground level to avoid any accidental collapse of the excavated pit.

Wooden well curbs had been used to serve the purpose in which dense wood pieces of tree trunks were fitted in circle. Now RCC well curbs are used for quick and smooth sinking of wells. Formerly dugwells were lined by stone masonry and now by bricks. RCC well curb is constructed according to given specifications with sharp cutting edge. Brickwork is started on well curb and reaches up to ground level. Brick load stays on cutting edge of well curb, which moves down in the soil. Soil below cutting edge is excavated by the skilled labor with special technique in such a way that structure erected on well curb may not tilt. Any mistake made at this stage mostly results in complete structural collapse.

Slow movement of structure down in the soil due to its own weight with a special technique is called sinking of well. Dry sinking of wells occurs when there is no water in well. When water comes in the well, dewatering is done by pumping and structure is moved down in short span of times. This process of dewatering and sinking is known as the wet sinking of dugwell. When structure is sunk up to desired depth, brickwork is started until it reaches the

ground level. This process is repeated many times to reach the designed depth of dugwell where sufficient water is contained for irrigation.

The design consideration of the dugwells are given as under:

- Command area to be irrigated
- Cropping pattern
- Water depth available in dugwells near the selected site
- Discharge and recharge rate of dugwells near the selected site
- Selection of dugwell diameter
- Water level and entrance velocity of water
- Water depth and volume of water stored
- Inflow and outflow equilibrium
- Best suited irrigation system for available discharge

Expected benefits of dugwell are given below:

- Assured irrigation to convert rain-fed farming to irrigated agriculture
- Virgin soil brought under irrigation becomes very productive
- Land value is increased
- Cropping intensity is increased by 100%
- Farm income is increased
- Water available in dugwells may also be used for domestic purpose, dairy animals and poultry birds

It is planned that **736** dugwells would be constructed under the proposed project to supplement the irrigation water for raising high value crops preferably through modern highly efficient irrigation methods.

7.2.1 Selection Criteria for Development of Dugwell

The farmers having farms with good quality groundwater would be provided financial support for development of dugwell to create a reliable water source for supplemental irrigation of crops. The selection of farmer for construction of dugwell will be made on uniform and transparent criteria approved under the project as proposed below:

The applicant:

- a) has agricultural land in command of small/ mini dam or outside the canal command area.
- b) owns technically feasible site based surveys.

- c) agrees to use stored water for irrigation purpose (preferably through drip and sprinkler irrigation) and would not use it for other purposes.
- d) is willing to contribute his share as per approved cost sharing formula.
- e) is not a defaulter of any government financial institution.
- f) agrees to abide by the decisions of the Project Implementation Committee (PIC) or the authorized representative of the department and will not challenge the same in any court of law.
- g) is willing to pay back full cost of government share in case he/she violates any of terms and the conditions.
- h) agrees that he/she will be fully responsible for aftercare/ successful operation of the intervention and there will be no responsibility on the department for any damage once the site is commissioned.
- i) undertakes to rectify any damage, which might hinders the usefulness of the intervention regarding irrigation of crops.

7.2.2 Cost Sharing Arrangements

The cost sharing formula for construction of dugwell envisages that the government will provide a maximum amount of Rs. 480,000 if the cost of dugwell construction exceeds Rs. 800,000 while, the government will provide 60 percent of the cost when the total cost of pond construction is less than Rs. 800,000. The remaining cost, approximately 40 percent, will be borne by the beneficiary farmer. The unit cost breakup of dugwell is enclosed (**Annexure-C**).

7.2.3 Implementation Arrangements

It is planned that the OFWM staff will motivate the farmers for construction of dugwell on the pattern of watercourse improvement or installation of HEIS. The field staff in the respective tehsil will carry out requisite engineering survey of site, prepare design, and cost estimates in consultation with the concerned farmer. The same will be checked and verified by the project consultants. The farmer will execute all the construction works under the technical supervision of OFWM staff. Following implementation procedure will be adopted for construction of dugwells in the project area. The ABAD/ Directorate Soil Conservation will carry out these activities by adopting same procedure.

- i. Design and cost estimates of dugwell will be prepared by OFWM staff, which will be approved by the project consultants
- ii. The rates of excavation and construction materials will be fixed by the relevant District Rate Committee (DRC)
- iii. The farmer will arrange all required materials and labour at site for excavation and construction of dugwell as per approved design and standards & specifications
- iv. The works will be verified by the project consultants

On receipt of verification report, the government share of the approved costs will be released to the farmer by the Director General Agriculture (WM)/ Project Director (PD) in three installments on recommendations of the project consultants as per following criteria:

First Installment

Release of 50 percent of the government share on receipt of verified First Intermediate Completion Report (ICR-I) from the consultants certifying following requirements.

- ◆ Design and cost estimates has been approved
- ◆ Approval/ work order has been issued by the competent authority
- ◆ Excavation upto confirmation of water availability has been completed

Second Installment

Release of 40 percent of the remaining government share for development costs after verification of Second Intermediate Completion Report (ICR-II) certifying the followings.

- ◆ Completion of entire excavation work
- ◆ Completion of all civil works
- ◆ Rectification of any pending discrepancy

Third Installment

Release of remaining 10 percent of the government share on receipt of Final Completion Report (FCR) from consultants certifying following factors.

- ◆ The work order has been issued for installation of HEIS at dugwell site for efficient utilization of stored water

7.3 Installation of Solar Systems at Farm Ponds and Dugwells

7.3.1 Prospects of Solar Energy in Pakistan

Nature has blessed Pakistan with abundance of renewable energy resources, which have not been harnessed appropriately. Replacing or supplementing the conventional fuels for operating water lifting pumps and operating high efficiency irrigation systems with solar energy seems workable option as sunlight is available for more than 300 days a year in Pakistan/ Punjab with about 8 hours of effective daylight period. Pakistan lies in an area of one of the highest solar insolation in the world and has immense solar resources, suitable for both Photovoltaic (PV) and Thermal Solar Power applications. Certain regions of South Quetta valley and Central Punjab receive maximum solar radiation. The Annual Direct Normal Solar Radiation is in the range of 6.5 to 7.5 kWh/m²/day in different parts of Balochistan, 5.0 to 5.5 kWh/m²/day in

Southern Punjab & Northern Sindh and around 4.5 to 5.0 kWh/m²/day in rest of Pakistan (Figure-4).

Most parts of the Punjab province receive adequate solar radiation intensities over 5 kW/m²/day. Its seasonal variations are also within acceptable limits. The arid/semi-arid climate of the Punjab, therefore, provides ideal conditions for adoption of solar energy for operating irrigation water pumps for lifting water from ponds, dugwells and operating drip irrigation systems for irrigation of crops. Although solar is one of the best renewable energy sources for pumping water but at the same time it has certain limitations in the form of high initial cost and non-availability of locally manufactured equipment.

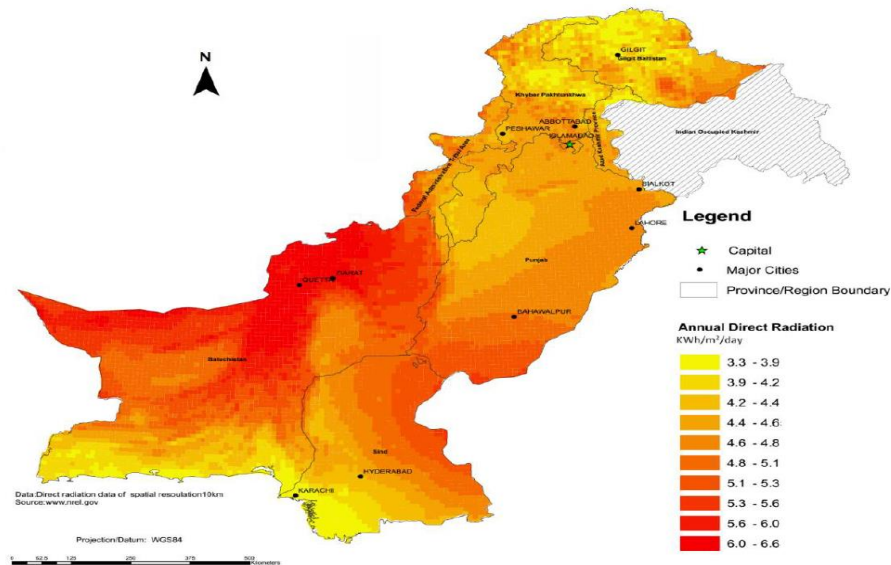


Figure-4: Prospects of Solar Radiation/ Energy in Pakistan

7.3.2 Solar Water Pumping Technology for Irrigation

Presently, solar powered water pumps are globally restricted to applications where other energy sources are not feasible/available. The technology is advancing steadily, especially in the developing world like Asia and Africa. Its main uses have, however, been for drinking and small-scale irrigation.

The Indian government provided subsidy for solar water pumping systems on a small scale for these purposes in few states like Rajasthan, Gujrat, and Haryana. Rajasthan government is currently providing subsidy for installation of solar tubewells in 16 districts for irrigating orchards & vegetables with drip system. Likewise, the government of Gujrat is subsidizing 500 solar water pumps to promote high-tech agriculture.

Pakistan is building solar power plants in Azad Kashmir, Punjab, Sindh and Balochistan. The program is under development by the International Renewable Energy

Agency, China, and Pakistani private sector. Pakistan has also set a target to add 5%, approximately 10,000 MW electricity through renewable energies by year 2030 besides replacement of 5% diesel with bio-diesel by year 2015 and 10% by 2025. In Pakistan, a few solar water pumps were installed by Thardeep Rural Development Program (TRDP) in Kasbo and Rarrkua villages of Nagarparkar district, which are being used to operate family drip systems for growing vegetables/fruits on 2-3 acres. Moreover, solar energy operated small size tubewells have been installed privately at few sites in Punjab for irrigation purposes.

The Punjab Agriculture Department has implemented a pilot scheme for testing of solar powered tubewells at nine (9) selected government farms, which remained quite successful. Moreover, the Punjab Agriculture Department has recently implemented an ADP funded project titled, “Promotion of High Value Agriculture through Provision of Climate Smart Technology Package” very successfully for the installation of solar systems for operation of high efficiency irrigation systems (drip irrigation) on 20,000 acres.

The above said experiences have revealed that although the solar water pumping system has high initial cost but;

- the system has a trouble free operation once installed
- it is a reliable option, especially for remote areas, and;
- more effective if used with drip irrigation

Use of solar energy for pumping water offers many advantages as compared to traditional paraphernalia such as a diesel engine or electricity operated tubewells/pumps (**Figure-5 and 6**). Solar water pumping system will have following advantages, albeit, some limitations (**Table-1**). The major impediment is the lower energy output (wattage) available with present affordable systems.

Table-1: Advantages and Limitations of Solar Water Pumping

Advantages	Limitations
<ul style="list-style-type: none"> - Increases the intervention adoptability - Non-dependant on conventional energy (fuel and electricity) - Little maintenance - Easy to operate and maintain - Uninterrupted water supply for irrigation during day time - Potentially long panel life - Feasibility in remote areas - Environment friendly 	<ul style="list-style-type: none"> - High initial capital cost - Unfamiliar technology - Equipment economical for only low discharges - Actual economical life not yet established - Susceptible to theft and vandalism

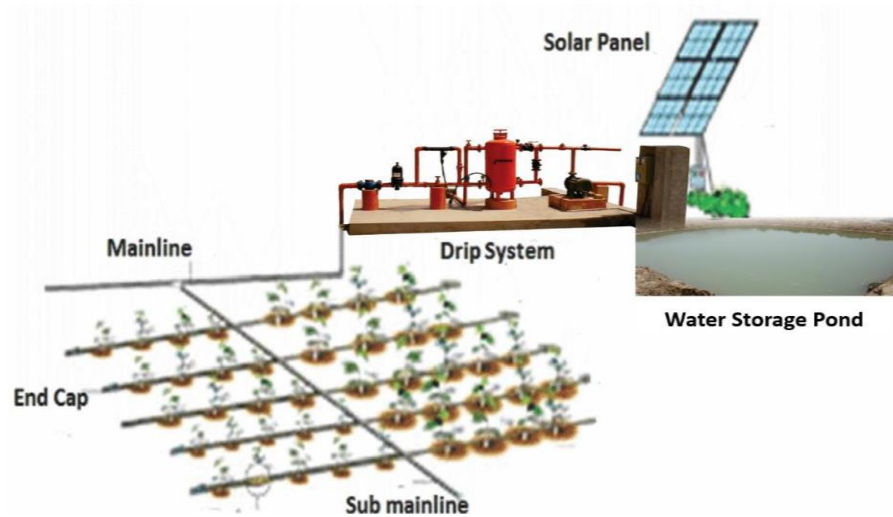


Figure-5: Typical Layout for Solar Powered Drip Irrigation System on Farm Pond

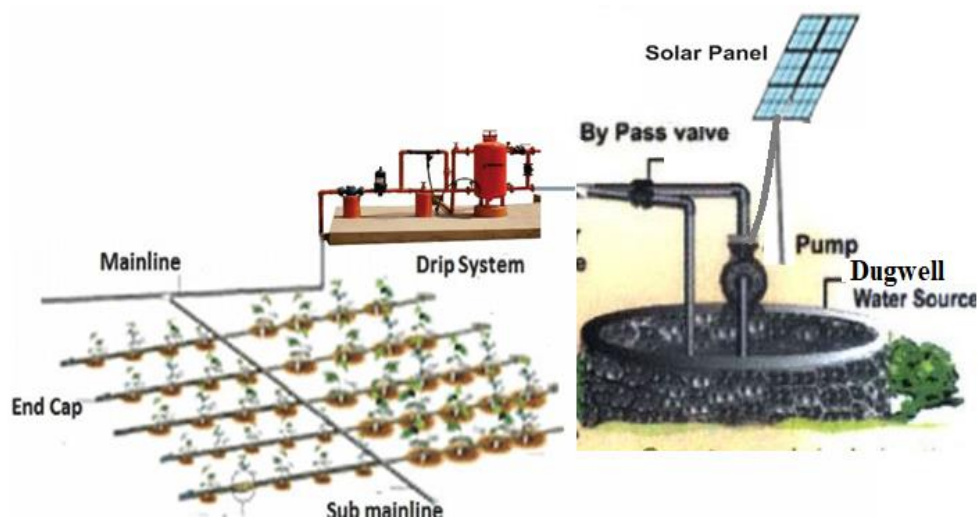


Figure-6: Typical Layout of Solar Powered Drip irrigation System on Dugwell

It is planned to install solar systems at farm ponds and dugwell sites preferably for operating the HEIS by lifting water from pond and dugwell for supplemental irrigation of crops. These arrangements will help to ensure timely availability of irrigation water for crops, particularly at their critical stages through uninterrupted water supply with solar powered water pumping systems. The area under solar system would be considered equal to the acreage irrigated by a farm pond or dugwell for reporting purpose.

The component will support installation of **1,216** solar systems on about **480** farm ponds and **736** dugwell sites. It is proposed that these systems will be provided to those farmers who have constructed farm pond and dugwell or owns already constructed farm pond and dugwell and have either already installed the high efficiency irrigation systems (HEIS) or willing to install the same under the ongoing PIP- Revised project. The component-wise unit cost

breakup for installation of solar-powered pumping system for pond and dugwell is enclosed (**Annexure-D-1 and D-2**).

7.3.3 Selection Criteria for Provision of Solar Pumping System

The solar water pumping units affordable by small landholders would be provided to the farmers having constructed the water storage pond and dugwell at their farms with good quality irrigation water. Accordingly, following criteria is proposed for selection of farmers/farms for the purpose.

The applicant:

- a) has constructed farm pond or dugwell under this project or owns already constructed farm pond or dugwell.
- b) a farm pond/ dugwell with sufficient water to meet requirement of planned crops
- c) has got issued the work order for installation of drip irrigation system.
- d) is willing to contribute his share of cost as per approved cost sharing formula.
- e) agrees to use solar pumping system for irrigation purpose and would not use solar system for any other purpose.
- f) undertakes that he/she will not sell, transfer, or hand over possession of the solar system to any other person in any form within project period.
- g) is not a defaulter of any government financial institution.
- h) will abide by the decisions of the Project Implementation Committee (PIC) authorized representative of the government and will not challenge the same in any court of law.
- i) Undertakes to return full cost of the equipment in case he/she uses it for flood irrigation or violates any of the conditions of the scheme.
- j) agrees that he/she will be fully responsible for safety of the solar plates to avoid vandalism/ stealing/ damage by animals and there will be no responsibility on the department for such damages and he/she agrees to rectify the damage to make the system operative from his/ her own resources.

7.3.4 Cost Sharing Arrangements

It is planned that the government will provide maximum Rs. 720,000 for installation of solar pumping system at pond site, if the cost of solar pumping system is more than Rs. 1.2 million while, the government will provide 60 percent of the cost when the total cost is less than Rs. 1.2 million. The remaining cost in both cases will be borne by the beneficiary farmer.

Similarly, the government will provide upto Rs. 480,000 for installation of solar pumping system at dugwell site, if the cost of solar pumping system exceeds Rs. 800,000 while

the government will provide 60 percent of the cost when the total cost is below Rs. 800,000. The remaining cost in both cases will be borne by the beneficiary farmer.

This will encourage the farmers for adoption of this new intervention for lifting water from water storage pond & dugwell and operating irrigation system for successful crop cultivation with limited water supplies, which may result in greater demonstration effect for up scaling the technology. The farmers will be responsible for sustainable operation and maintenance of the installed systems.

7.3.5 Implementation Arrangements

It is indicated that provision of solar systems for operation of HEIS has already been successfully implemented by the OFWM under the ADP funded project titled, “Promotion of High Value Agriculture through Provision of Climate Smart Technology Package”. Accordingly, it is planned that the same procedure would be followed for the installation of solar pumping systems at farm ponds and dugwell sites under this project. The supply & services companies (SSC’s) already prequalified under the above-mentioned project for installation of solar systems would be eligible for providing services under this project. However, if required, more companies will be prequalified as per already approved criteria to fulfill the requirements for installation of solar systems. Following implementation procedure would be adopted for the installation of solar water pumping systems at pond and dugwell sites:

- a) The standards & specifications already developed and standardized by the Agriculture Department for installation of solar equipment under the ADP funded project, “Promotion of High Value Agriculture through Provision of Climate Smart Technology package” will be adopted (**Annexure-E-1 to 11**).
- b) The supply & service companies (SSCs) already prequalified by the Prequalification Committee (PQC) under the above said ADP project will be engaged for installation of solar pumping system at water storage pond and dugwell sites.
- c) Applications will be submitted by the farmers/ WUAs individually on the prescribed application form and only one member of the family will be eligible. Application forms will be available in the office of Deputy Director Agriculture (OFWM) free of cost.
- d) The application will be accompanied by an affidavit containing following declarations for which necessary documents would also be attached to support the claims.
 - i. The water pumped from water storage pond or dugwell is sufficient and fit for supplemental irrigation of the planned crops
 - ii. Farmer has preferably installed or willing to install drip irrigation system later on

- iii. The beneficiary is ready to contribute his share as per approved cost sharing formula as well as willing to bear post installation maintenance costs
 - iv. Applicant is not a defaulter of any government organization or financial institution
 - v. Applicant is willing to get requisite training on operation & maintenance of solar system
 - vi. The beneficiary farmer agrees to use solar system for operating HEIS only
 - vii. The farmer will not sell/ transfer/ handover to any other person in any form within two years
 - viii. The applicant will pay back entire subsidy in case of violation of terms and conditions of subsidy
 - ix. The farmer will be responsible for any physical damage/theft and its rectification at his/ her own cost
 - x. The farmer will abide by all the directions/ decisions of the department/ authority
- e) The applications will be scrutinized against approved criteria and eligible applicants will be advised to approach the pre-qualified/ designated SSC of their own choice for survey, design, and cost estimation of solar pumping system.
 - f) The selected SSC will survey the site, prepare design and bill of quantity (BOQ), and submit the same to the project consultants through DDA (OFWM) for review and approval.
 - g) The farmer, after approval of design and cost estimates, will be advised by the concerned Deputy Director Agriculture (OFWM) to deposit his/her entire share in the form of pay order/bank draft drawn in favor of selected SSC, which will be transmitted to Director General Agriculture (Water Management) for issuance of work order.
 - h) The work order will be issued by the DGA (WM) and SSC will be bound to deliver the solar equipment alongwith other accessories as per BOQs at site within the prescribed time frame, mentioned in Tripartite Agreement or work order.
 - i) The delivered equipment will be inspected against approved specifications and BOQs by the project consultants.
 - j) After inspection of the delivered equipment, 50 percent of the system cost including pay order/ bank draft submitted by the farmer and remaining from the project funds will be paid by the DGA (WM) on recommendation of the consultants conveyed by concerned DDA (OFWM).
 - k) The SSCs will complete the installation of solar system within 30 days after delivery/inspection of equipment. The installed system will be verified by the project consultants for its performance as per approved design and specifications.

- l) The consultants will ensure that the installed system is according to the approved guidelines, compatibility, and performs successful operation of irrigation system.
- m) The performance of installed solar system will be evaluated in terms of operation, design and discharge efficiency etc., and solar system will be handed over by the SSC to the beneficiary farmers in the presence of consultants and departmental representatives. At the time of handing over the system, the SSCs would ensure that
 - i) Farmer of has been trained in operation & maintenance of the solar system;
 - ii) Logbook has been provided to the farmers;
 - iii) O&M manual in Urdu has been provided to the farmer; and
 - iv) Warranty card of the equipment has been handed over to the farmer.
- n) On the recommendation of the project consultants conveyed through DDA (OFWM), DGA (WM) will make remaining 40% payment to the SSC keeping 10% as retention money, which will be released after two-year of successful system operation.
- o) Concerned DDA (OFWM) will submit monthly report to the concerned Director Agriculture (OFWM) and Director General Agriculture (Water Management) Punjab on performance of the installed solar system.
- p) The SSCs will be bound to provide the post installation services for a period of at least two years.

7.4 Watercourses Improvement

This component will comprise of improvement/ construction of conveyance infrastructure including lining/ improvement of watercourses in the command of small/ mini dams and other water sources of the project area. It would support improvement of water conveyance efficiency and ensure supply of water from various water sources for irrigating the crops. It is indicated that access to land and water are considered as the keystones for prosperity and improvement/ development of farm level water conveyance network is critical to harness the benefits of available water resources. The farm level water conveyance network i.e., watercourses in command area of most of the small dams either don't exist or existing structures have not been properly constructed/ maintained due to different socio-economic and technical factors such as undulated topography, fragmented vis-à-vis small land holdings, light soils etc.

There are very few farmers who have developed their land adjacent to the existing conveyance infrastructure and majority could not do so, owing to non-existence of equitable irrigation water distribution system i.e. warabandi in the command of small dams. Moreover, agricultural lands in rainfed areas are usually undulated having hills, dunes etc., and elevation difference of one field to the other demands special design considerations and technical expertise, which is currently not available with the farmers. Outlets are not properly designed

resulting in improper working head for downstream outlets causing troubles in water delivery when it is diverted at the upstream level. Likewise, illegal water diversion through tempering the outlets is a common practice.

It has been observed that a significant portion of irrigation water (about 40%) is lost in the earthen watercourses. The main sources of water losses are seepage, spillage, and side leakage from the watercourses, resulting from following factors:

- Irregular profile and zigzag alignment of banks, with many points of weakness
- Variable cross section of water channels
- Silt deposition, causing restrictions in flows, and overtopping
- Trees, shrubs, and vegetation growing in watercourses
- Damage caused by rodents and farm animals
- Frequent bank cutting and plugging for water abstraction

A few glimpses of unimproved watercourses showing irregular sections and water losses are shown in **Figure-7**



Figure-7: Unimproved Watercourse

In view of above challenges, there is dire need to carry out lining/ improvement of the existing farm level irrigation network i.e. watercourses in the command of small/ mini dams or outside canal command in the project area. These works will be carried out through active involvement of the farming community by organizing them into Water Users Associations under “On Farm Water Management & Water Users Association Ordinance [Act]-1981 (Amended 2001)”. Therefore, it is very important to mobilize the farmers to ensure rehabilitation of the water conveyance infrastructure/ regularize the turnouts by construction/ lining of watercourses.

7.4.1 Watercourse Improvement Impact

The watercourse improvement is the most studied and researched intervention amongst all OFWM activities. Its numerous evaluation and impact assessment studies have been carried out by various national and international organizations/institutions. The impact evaluation study carried out by the Planning Commission of Pakistan titled “Project Impact Evaluation Study (PIES) for National Program for Improvement of Watercourses in Pakistan (NPIW)” is the most recent one, which reveals that the intervention is highly cost effective option for improving water availability at farm gate. The impact of watercourse improvement is given in **Table-2** below.

Table-2: Watercourse Improvement Impact

Sr. No.	Impact	Extent
1	Annual water saving (acre feet)	119
2	Improvement in crop yields (%)	2-15
3	Increase in cropping intensity (%)	4
4	Saving in irrigation time (%)	28
5	Expansion in irrigated area (%)	21
6	Reduction in labor for irrigation (%)	50
7	Enhancement in farm incomes (%)	15
8	Decrease in conveyance losses (%)	39
9	Curtailement in saline area (%)	87
10	ERR (%)	28.1
11	B:C ratio	2.3:1

7.4.2 Lining Options

Under continuous rise in demand for bricks, weaker price control, and dwindling quality of bricks, the Precast Concrete Parabolic Segments (PCPS) lining has emerged as alternate of bricks being more efficient, durable, quick in installation, and relatively more economical. Owing to topography of the Pothohar and other non-canal command areas, the pipe lining of watercourses has successfully been done under OECF (Japan), DERA, BIMRC, NPIW, district governments, and ongoing Punjab Irrigated-Agriculture Productivity Improvement Project (PIPIP-Revised). Keeping in view the topographic conditions of the project area, it is planned that pipe, PCPS and brick lining options would be adopted for lining/ improvement of watercourses considering field conditions and choice of the farmers (**Figure-8**). The PCPS supplier firms already prequalified under ongoing PIPIP-Revised project for supply of PCPS

would be eligible for providing services under the proposed project. However, more firms will be prequalified to fulfill the requirements of PCPS under the proposed project, if required.

Improvement of **600** watercourses in the project area has been planned under the proposed project. The unit cost breakup for improvement of a watercourse with pipe, PCPS and brick lining options is enclosed (**Annexure-F-1, F-2 and F-3**).



Figure-8: Glimpses of Lined Watercourse using Pipe, PCPS and Brick Lining

7.4.3 Selection Criteria for Watercourse Lining

It is planned that following criteria as followed under NPIW and PIPIP projects will be adopted to take up watercourses for improvement under the proposed project:

- a) Watercourse has not been previously improved by any government or private agency.
- b) The farmers are willing to form a water users association (WUA) and agree with the cost sharing arrangements to be followed under the proposed intervention.
- c) The shareholders agree to re-construct alternate katcha portion of the watercourse prior to commencement of lining work.
- d) Sections of watercourse to be lined will be selected as per following criteria.
 - i. Head reaches having maximum usage and flows.
 - ii. Elevated sections susceptible to leakage, over topping, and spillage.
 - iii. Portion of watercourse crossing / passing through / along villages/roads.
 - iv. Sections having sandy/porous soils.

7.4.4 Cost Sharing Arrangements

The paying capacity of the farming community in rainfed areas is poor and, accordingly, it is difficult for them to mobilize matching resources for any development on their developing farms. A farmer-friendly cost sharing mechanism already adopted under previous OFWM projects and ongoing PIPIP has, therefore, been proposed for envisaged project interventions as under.

- (i) Farmers will contribute entire labour costs for
- ◆ Masons and unskilled labour of all civil works
 - ◆ Back earth filling of structures and lined section
 - ◆ Any other cost required during construction works

The farmers can contribute their share in cash and kind. The cash contribution requirement would generally be for the payments to be made by the WUA to the masons and labour for lining and installation of structures, while all remaining share such as labour for maintenance of earthen part can be contributed in kind.

- (ii) Government will bear the entire material costs for lining and structures (Pacca Nakkas, Culverts, Drops, Syphons, etc.)

As such, the government will provide upto a maximum of Rs. 300,000 (about 60%) against the total cost estimates of the watercourse improvement, while the remaining cost will be borne by the beneficiary farmers.

7.4.5 Organization of Water Users Association

Effective involvement and participation of the community drives the successful implementation of any development work, community based irrigated agricultural development in the rainfed areas is no exception. The community participatory approach adopted by the OFWM since its inception during 1976-77 is the key to success in completion of mega projects in the Punjab. The OFWM staff is successfully carrying out this function for last 40 years. They have organized more than 50,000 Water Users Associations (WUAs) under “On Farm Water Management & Water Users Association Ordinance [Act]-1981 (Amended 2001)” having membership of over two million farm families in the province for improvement of community based watercourses. The works under the proposed project will also be carried out through organization and registration of one WUA at each watercourse with following key responsibilities.

- a) Provide right of way for construction/ lining of watercourse
- b) Arrange skilled and unskilled labour required for improvement of alternate water channel, installation of water control structures, and lining of critical reaches of the watercourse
- c) Procure construction materials for carrying out civil works
- d) Settle matters of disputes amongst the water users in respect of channel excavation/ alignment, fixation of nakkas, distribution of work etc.
- e) Make arrangements for conveyance of water during execution of watercourse improvement works

- f) Carry out civil works in accordance with standards and specifications under the supervision of OFWM field staff
- g) Undertake regular O&M of improved watercourse

7.4.6 Implementation Arrangements

The tehsil level OFWM staff will mobilize shareholders of the watercourses to organize Water Users Associations (WUA). The same will be registered under OFWM and WUAs Ordinance [Act] 1981 (Amended 2001). The WUA will open a joint account to be operated by its Chairman and Treasurer in a Commercial Bank. The WUA will provide bank statement alongwith the specimen signatures of Chairman and Treasurer to Assistant Director Agriculture (OFWM) who will forward the same to Deputy Director Agriculture (OFWM). The WUA will execute an output-based agreement with Deputy Director Agriculture (OFWM) wherein, roles and obligations of both the parties will be defined. The agreement will be based on payments linked with achievement of physical milestones.

The OFWM staff in the respective tehsil will conduct engineering surveys of the watercourse command area and prepare design & cost estimates in consultation with WUA that will be checked/verified by the project consultants. The competent authority will accord Technical Sanction of estimated cost. The WUA will carry out lining of watercourse with PCPS or other lining options (pipe, brick) as per approved design. The funds will be released from relevant DDO code/ Cost center by the Deputy Director Agriculture (OFWM) into joint account of the respective Water Users Association, to be opened/ maintained in the commercial banks. These joint accounts of the WUAs will be operated in accordance with the watercourse improvement procedure approved by the Finance Department vide letter vide letter No. 1/1140-Agri-(FD)/11-P-VIII dated 12-09-2017 and is currently being followed/ in vogue under the PIP and ADP.

The Deputy Director Agriculture (OFWM) will release funds in three installments on recommendations of the project consultants as per following criteria.

First Installment

Release of 70 percent of the estimated cost on receipt of verified First Intermediate Completion Report (ICR-I) from the consultants certifying following requirements.

- ◆ Registration of WUA for the watercourse
- ◆ Approval of design and cost estimates
- ◆ Issuance of Technical Sanction (TS) by the competent authority

- ◆ Deposit of 70 percent farmers' share on account of labour charges for lining and installation of water control structures

Second Installment

Release of 20 percent of the estimated cost on receipt of Second Intermediate Completion Report (ICR-II) from consultants certifying followings.

- ◆ Deposit of remaining 30 percent of farmers' share on account of labour charges for lining/installation of water control structures etc.
- ◆ Completion of at least 70 percent planned lining and other works (volumetric basis)

Third Installment

Release of remaining 10 percent of the estimated cost on receipt of Final Completion Report (FCR) from consultants certifying following factors.

- ◆ Completion of all planned works
- ◆ Rectification of any pending discrepancy

The WUA will procure the construction materials living within the upper ceiling rates fixed by the District Rate Committee (DRC) for the tehsil/cluster and carry out civil works under technical supervision of OFWM field staff. The Deputy Director Agriculture (OFWM) will make internal monitoring of construction works while Director Agriculture (OFWM) will undertake external monitoring to ensure quality of works. The project consultants will carry out spot-checking and third party validation/final verification of improvement works. The flowchart of implementation arrangements for watercourse construction/improvement is shown in **Figure-9**.

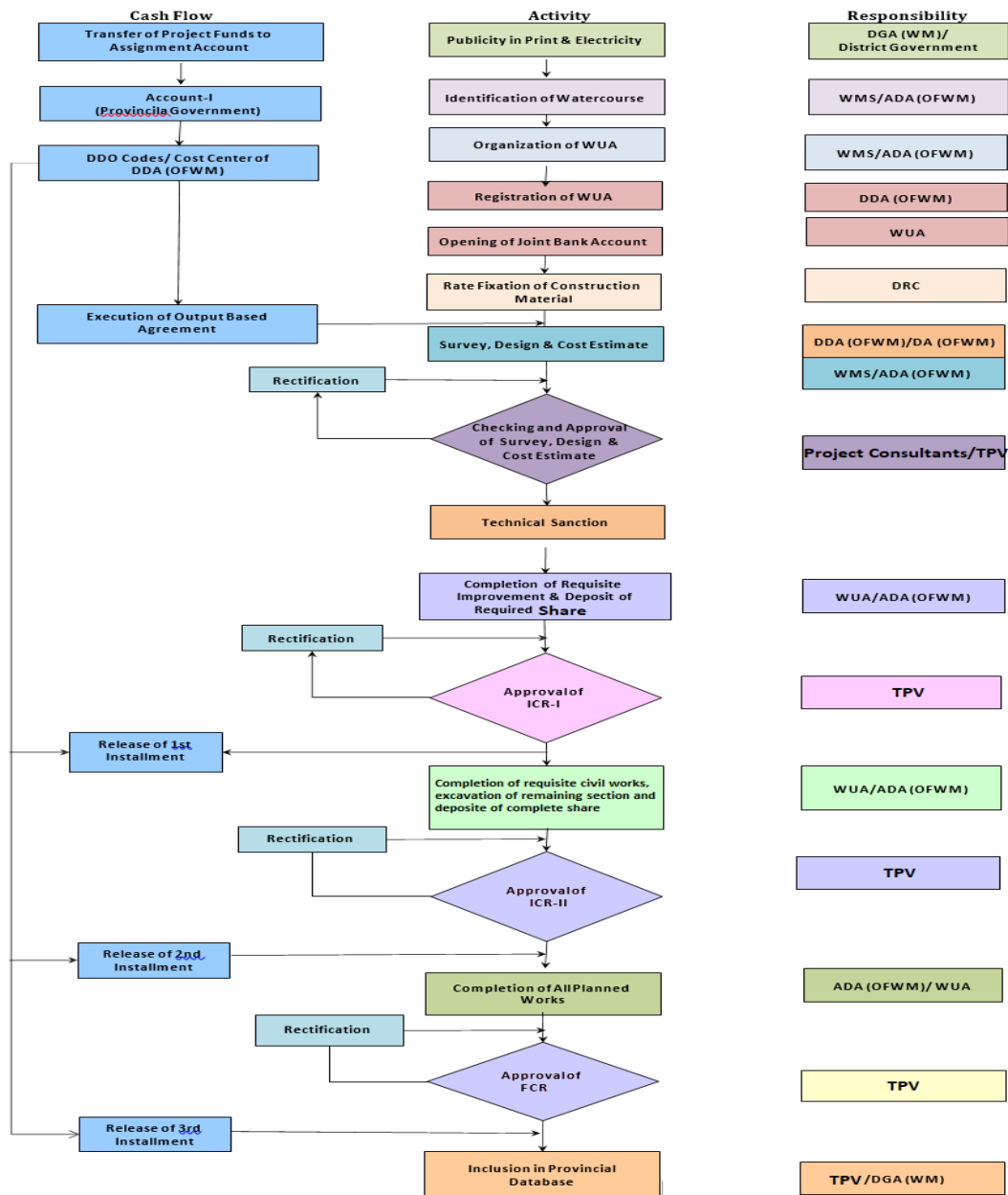


Figure-9: Schematic Process for Watercourse Improvement

7.5 Provision of LASER Land Leveling Units

The component will strengthen LASER land leveling services in the project area through provision of LASER levelers to the farmers/service providers on subsidized rates. A brief narrative about LASER land leveling technology, its benefits, need gap, implementation procedure, selection criteria for farmers/service providers and subsidy is discussed below.

7.5.1 LASER Land Leveling Technology

Precision land leveling (PLL) is a mechanical process of grading and smoothing the land to a precise and uniform plane surface at grade or no grade (zero slope) with variation of less than ± 20 mm (2 cm). Generally, traditional method is used for PLL that involves earth

movement with bucket type soil scrapers and tractor mounted rear blades but it is very laborious and too expensive to finish the land surface to exact grade.

Precision land leveling is being promoted since inception of OFWM Program. Use of LASER technology in the precision land leveling is the latest development, which was introduced in the Punjab during 1985. The LASER controlled land leveling system consists of a LASER transmitter, a signal receiver, an electrical control panel, and a solenoid hydraulic control valve. The LASER transmitter transmits a LASER beam, which is intercepted by the signal receiver mounted on a leveling blade attached to the tractor. The control panel mounted on the tractor interprets the signal from the receiver and opens or closes the hydraulic control valve that raises or lowers the leveling blade (**Figure-10**). The same has proved to be highly beneficial because it minimizes the cost of operation, ensures better degree of accuracy in much lesser time, saves irrigation water, ascertains uniform seed germination, increases fertilizer use efficiency, and resultantly enhances crop yields.

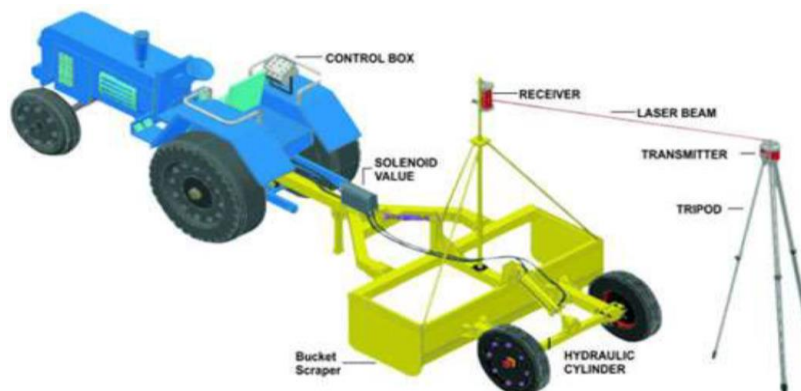


Figure-10: LASER Land Leveling Operation

7.5.2 LASER Land Leveling Impact

LASER land leveling is the most effective and popular technology amongst farming community because of its highly quick returns/benefits. The LASER land leveling technology is now being used adequately by the farmers in all districts of the Punjab. The glimpses of Laser operation are shown in **Figure-11**. It is pointed out that an impact assessment study was carried out by Planning & Evaluation Cell of Agriculture Department during 2008 for evaluation of LASER land leveling technology, which reveal following impacts at the farm level.



Figure-11: Glimpses of LASER Land levelers

- i) Saving in irrigation time from 25.1 to 32.1 percent
- ii) Increase in irrigated area by 34.5 to 42.0 percent
- iii) Improvement in crop yields from 10.7 to 12.9 percent
- iv) Reduction in farm cultureable waste land by 2.10 percent

The impact assessment carried out by the Monitoring and Evaluation Consultants of PIPIP for LASER land levelers provided under original PIPIP has shown following results.

- ◆ Saving in irrigation time: 20-30%
- ◆ Improvement in crop yield from 9-11%
- ◆ Enhancement in fertilizer use efficiency: 11%
- ◆ Saving in farm labour: 18 %
- ◆ Facilitation in better crop stand, uniform moisture availability and enhanced fertilizer use efficiency
- ◆ ERR 29.6%
- ◆ B/C Ratio 1:1.5

Considering the huge benefits of the technology, it has been planned to provide **500** Laser land leveling units to the farmers/ service providers in the project area to strengthen the LASER land leveling services in the private sector. The district-wise quota and unit cost breakup of LASER land levelers are enclosed (**Annexure-G and H**).

7.5.3 Cost Sharing Arrangements

The adoption of new agricultural machinery by small farmers depends on prevailing socio-economic conditions, market prices, access to information about impact of such technology, availability of credit/loan facility, and most importantly financial resources or paying capacity to buy/hire such equipment. The cost of technology also plays a key role in its adoption/procurement, especially by the small farmers in developing countries like Pakistan where majority of farmers (85%) cultivate less than 12 acres of land. During recent past, their

financial capability has been eroded severely because of escalated costs of production and market price crash of all agricultural commodities. It has become very difficult for small farmers to procure the agricultural technology/machinery even though government provides considerable financial assistance, LASER land leveler is no exception.

It is planned to provide one time financial assistance of Rs. 250,000 per LASER unit to the farmers/ service providers while the beneficiary farmer would contribute the entire remaining cost of the equipment. This will encourage the farmers for adoption of this intervention and urge for sustainable operation and maintenance of this intervention in rainfed areas. It is indicated that as the beneficiary farmer is required to own a tractor capable of operating LASER unit and submit valid document/ proof for the purpose. The current price of such a tractor is about 1.10 million. Thus, the total contribution of the farmer comes to be around 84 percent of total investment and the government is in fact providing 16 percent only (**Annexure-H**).

7.5.4 Selection of Farmers/Service Providers

An applicant will be eligible for the grant of financial assistance provided that the person:

- i. possesses a tractor capable of operating LASER unit;
- ii. is owner/tenant/lease and self cultivator of land not more than 12.5 acres which is located outside canal command and is preferably agricultural machinery service provider or an agricultural graduate possessing requisite land ownership;
- iii. will agree to rent out the equipment for LASER land leveling in the area;
- iv. undertakes to carry out/provide rental services for LASER land leveling of 300 acres per unit annually during project period; and
- v. will be liable to pay full amount of financial assistance received for the purpose as arrears of land revenue in case of violation of any of the conditions of the scheme.

The provincial steering committee (PSC) would be authorized to amend/modify the above said criteria for selection of farmers/service providers.

7.5.5 Implementation Arrangements

It is indicated that well understood and accepted approach, introduced under previously completed schemes and replicated under the original PIP and ADP scheme, will be continued with little modification for provision of LASER units to the farmers/ service providers under this project. The implementation modalities followed are described hereunder:

- i) The annual quota for each district, preferably based on balance requirement of LASER land levelers, will be approved by the Project Steering Committee (PSC) and the same will be conveyed to the districts by the DGA (WM);
- ii) Massive awareness and publicity campaign will be launched through print/electronic media at the provincial level as well as in the districts;
- iii) DGA (WM) will advertise for invitation of applications from the farmers interested to work as service providers for LASER land levelling rental services;
- iv) All districts will be informed about the time bound action plan for provision of LASER land levelers to the farmers/service providers;
- v) The applications will be received/ collected in the office of DDA (OFWM) that will be scrutinized vis-à-vis approved criteria by the designated committee;
- vi) The ineligible applicants will be informed about rejection of their applications who may submit appeal against the ineligibility within specified period and concerned authority will decide the eligibility/ ineligibility after hearing appeals within stipulated timeframe;
- vii) The DDA (OFWM) will convey the complete list of eligible applicants to the DGA (WM) for confirmation of quota as the activity will be demand driven. In case of less number of eligible applicants than allocated quota, the extra LASER units will be allocated to other districts where demand is higher than the available quota for the district;
- viii) The allotment of LASER units to the eligible applicants will be made by the District Allotment Committee (DAC) through balloting;
- ix) The allotment letters will be issued to the successful applicants by the DDA (OFWM) with the advice to book LASER units with pre-qualified firm within 30 days of allotment by submitting original draft of his/her entire/full share, drawn in favour of short-listed firm of his/her choice to concerned DDA (OFWM);
- x) The DDA (OFWM) will retain the original bank draft and forward its copy alongwith his recommendation to the DGA (WM) for issuance of work order to concerned firm;
- xi) Director General Agriculture (Water Management) will issue advice to the concerned firm for supply of booked LASER unit within 90 days of the issuance of this advice (or period specified in the supply order) under intimation to the concerned DDA (OFWM);
- xii) The supplier firm will ensure delivery of booked unit within stipulated period and defaulting firms will be dealt as per government Rules;
- xiii) In case of failure of a firm to deliver the unit within specified time, the farmer will have the choice to book the LASER unit with one of the other pre-qualified supplier firms through concerned DDA (OFWM) and DGA (WM);
- xiv) A committee headed by the concerned DDA (OFWM), representative of concerned Director Agriculture (OFWM), recipient farmer/service provider, and Field Engineer of consultants will inspect the equipment, handover to the farmers/service providers,

jointly and record the make, model, serial number and other features of all components of LASER unit;

- xv) The DDA (OFWM) will handed over the original bank draft of farmer's share to the concerned supplier firm under proper acknowledgement;
- xvi) The technical inspection report, duly signed by the inspection committee and receipt of bank draft will be sent by DDA (OFWM) to the DGA (WM) alongwith his recommendation for releasing the government share; and
- xvii) DGA (WM) will make payment of project assistance to the concerned firm through cross cheque.

The Project Steering Committee would be authorized to reduce/ increase the targets of any district based on specific/justified reason for smooth implementation of the project. The schematic process for provision of LASER land leveling equipment is given in **Figure-12** below.

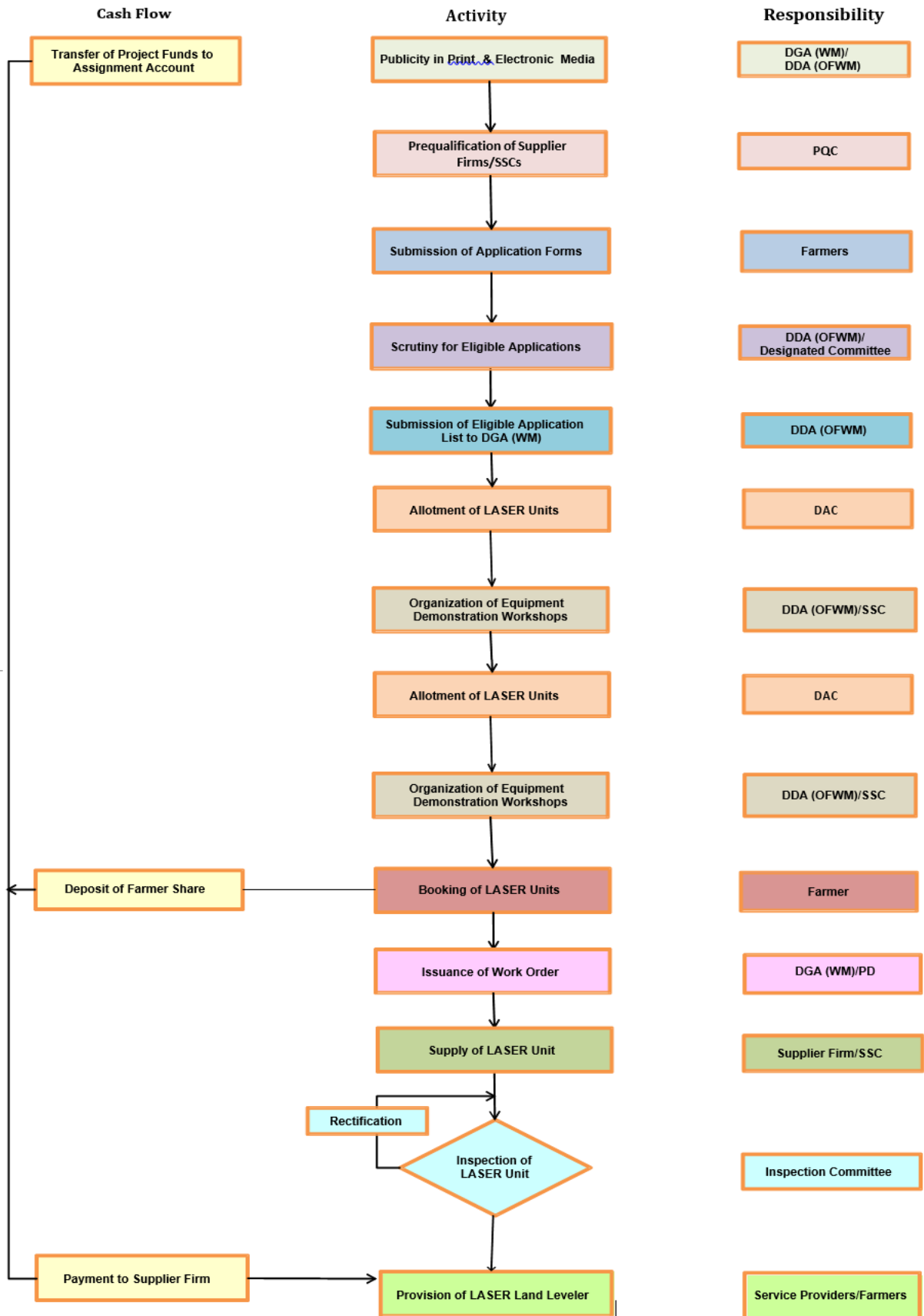


Figure-12: Schematic Process for Provision of LASER Land Leveling Equipment

8 THE AGRICULTURE EXTENSION COMPONENT

Horticultural crops have significant potential in vertical as well as horizontal expansion along with enhanced employment opportunities for the rural poor masses including women force working in the field for their livelihood. It contributes in poverty alleviation, nutritional security and have ample scope for farmers to increase their income and helpful in sustaining large number of agro-based industries which generate huge employment opportunities.

The fruits which can successfully grown and included in this project are Olives, Citrus, Peaches, Grapes, Mango and Loquat, etc. Change in cropping pattern through high value crops like establishment of fruit orchards will be done through motivation, training and financial assistance to farmers. On potential sites minimum 1 acre of orchard would be established at each beneficiary farmer. The inputs would be provided by the Extension Department. The subsidy would be provided after verification of successful establishment of orchard in the field.

Oilseed crops are extremely vital for domestic oil production. Edible oil, extracted from oilseed crops has 2.5 times more energy than protein and carbohydrates. Edible oil from oil seed crops, being rich in essential fatty acids, Vitamin D and E, having zero cholesterol and higher percentages of mono and poly unsaturated fats, are rightly preferred over ghee from animal source. Pulses are part of a healthy, balanced diet and are a low fat source of protein, with a high fibre content and low glycemic index. Pulses provide important amounts of vitamins and mineral. Some of the key minerals in pulses include iron, potassium, magnesium and zinc. Pulses are also particularly abundant in B vitamins; including folate, thiamin and niacin.

Fodder crops are rich in Fibre, digestible protein, minerals and vitamins required for balanced diet to animals. Fodders are cash crops for farmers and has multipronged importance among agricultural crops being sown in Barani region. It meets more than 50% of animal dietary requirements. It also restores fertility status of soil when it comes to leguminous fodder. To meet the increasing demand of forage for Livestock, it is need of the time to bring more area under fodder cultivation in order to overcome the forage scarcity period (May-June and October-December). Major fodder crops to be taken under this project will be maize, millet and oats. Since, it requires extraordinary skills and highly capital intensive activity so special efforts are required for its promotion. The Agriculture Extension activities would preferably linked with OFWM interventions to ensure the water availability for raising the fruits, pulses, oilseeds, fodder etc. The detail of proposed activities by the Extension Department is attached (**Annexure-I**).

9 TRAINING AND CAPACITY BUILDING

This component will support awareness creation, communication, training and capacity building of stakeholders as well as demonstration of different activities for promotion of irrigated agriculture and high value crops.

9.1 Awareness Creation

The need for judicious and economical use of scarce water resources for sustainable irrigated agriculture is becoming increasingly important day by day. On Farm Water Management is promoting various water management technologies and techniques for improving water productivity at farm level. The well-informed and knowledgeable farmers contribute significantly in enhancing productivity of all factors of production i.e. water, nutrients, energy, labor, capital etc.

The farmers in the project area are normally practicing rain-fed and traditional agriculture due to lack of irrigation facilities and knowledge about more profitable modern agricultural techniques and technologies. The development of irrigation infrastructure would bring a paradigm change in the area. Accordingly, good working knowledge of the farmers would be required for crop production with the limited available water.

It is, accordingly, planned to launch an extensive awareness campaign and motivate farming community to actively participate in project activities for improving water as well as crop productivity vis-à-vis profitability. The farmers will be made aware of efficient irrigation methods, farm layout planning and improvement, water saving agronomic practices, soil moisture measuring/ monitoring tools and techniques, cultivation of high value crops under drip and sprinkler irrigation etc. It is also planned to organize farmer days/ road shows for creating awareness amongst the farming community regarding project interventions and their benefits. Latest Information and Communication Technologies (ICT) would be used for awareness creation and media campaign.

9.2 Capacity Building

Capacity building of farmers, professionals and sub-professionals is imperative for carrying out the envisaged project activities as well as creating awareness about the irrigated agriculture technologies/ techniques for their successful adoption. It is planned to formulate a comprehensive need based training program for all stakeholders including the farmers and water users association, who will be trained in operation and maintenance of newly constructed farm ponds, dugwells, solar pumping systems, watercourses, crop cultivation under HEIS, successful cultivation of high value crops etc. The training of professionals and

sub-professionals in different aspects of project implementation would significantly increase trained manpower and knowledge based human resource for promoting modern water management interventions to improve water productivity in the project area. Similarly, training of OFWM staff would also be done regarding latest social mobilization and communication tools, successful project execution, environment management, monitoring & evaluation (M&E), risk management etc.

It is planned that that capacity building of farmers/ water users associations for operation and maintenance of watercourses and adoption of improved OFWM interventions. It is indicated that training for capacity building of the service providers/ farmers or their tractor/ LASER operators will be arranged for following activities:

- a) Survey and designing for LASER land leveling
- b) Planning and development of farm layouts considering soil types, farmer's tillage equipment, crops to be grown, source/ quality of irrigation supplies etc.
- c) Operation of LASER units
- d) Maintenance and trouble-shooting of equipment

Training courses will be conducted for LASER Operators in "LASER Land leveling" to train one operator for each LASER unit. It is planned that training course comprising of about 20 participants each will be arranged at Water Management Training Institute, Lahore. Accordingly, about 25 courses would be required for 500 operators.

The Water Management Training Institute (WMTI), Lahore will implement this component under supervision of DGA (WM)/ PD with technical assistance of project consultants. It is planned that annual plan regarding awareness creation and capacity building of stakeholders would be prepared and got approved from the Provincial Steering Committee. It is planned that the farmers will be trained in the operation and maintenance of all project interventions in a sustainable way. An amount of about Rs. 21.20 million has been estimated for awareness creation, capacity development and monitoring & impact assessment of the project.

10 THIRD PARTY VALIDATION (TPV) CONSULTANTS

Third Party Validation (TPV) Consultants will be engaged for implementation supervision and third party validation of project activities. Their main responsibilities will be design review/approval, construction supervision, quality assurance, technical assistance, and overall coordination of project execution. The consultants' team primarily will report to the Director General, Federal Water Management Cell, Government of the Pakistan, Islamabad and

will coordinate with the Director General Agriculture (Water Management), Director General Agriculture (Ext. & AR) and ABAD/ Director Soil Conservation Punjab at provincial level for smooth execution of project activities but its major responsibilities will be in the districts. All records and sites will be open and available to the consultants to enable them to perform their functions. The Consultant Selection Committee (CSC) of the federal government will recruit the consultants in accordance with relevant guidelines. The entire cost TPV consultants will borne by the federal government as per decision of meeting dated 12-12-2018. The TPV Consultants' scope of work would include but not limited to the followings tasks.

- i) Prepare standards and specifications for civil works, LASER land leveling units, etc.
- ii) Draft technical documents/agreements/formats for Supply & Service Companies (SSCs) including contract conditions, specifications, materials/ equipment, etc.
- iii) Provide project management support services to the DGA (WM) and other stakeholders.
- iv) Help in evaluation of the technical and financial proposals of SSCs.
- v) Assist in mobilization and screening of farmers for WSP/ LASER land levelling units/Solar systems/watercourses as per criteria.
- vi) Facilitate in finalization of rates for various items and services.
- vii) Inspect and advise on standards, specifications, and criteria for the construction materials/ equipment etc.
- viii) Check surveys carried out by the field staff of executing agencies for verification.
- ix) Review and approve plans, designs, cost estimates for various project interventions.
- x) Facilitate timely completion of works and recommend onsite design modifications.
- xi) Spot check for quality of works during construction of a minimum of one third by their number.
- xii) Certify quantities and quality of completed works and delivered equipment for various project interventions.
- xiii) Verify financial resource transfer applications.
- xiv) Notify the Director General Agriculture (Water Management) and other executing agencies of compliance / non-compliance of works with agreed criteria and standards.
- xv) Submit monthly, quarterly, and annual reports for proposed project activities besides other periodic reports as per requirements of project management.
- xvi) Provide technical support for training of project staff in all project interventions as well as new techniques and technologies, if any.
- xvii) Deliver technical assistance for updating/ upgradation of GIS database and its management.

- xviii) Liaise with provincial, divisional, and district project management for smooth execution of field activities.
- xix) Extend technical support to maintain a website containing information on facilities and services, applications, procedures, watercourses database etc.

11 MATERIALS, SUPPLIES AND EQUIPMENT REQUIREMENT

Mainly, it is planned to utilize the existing facilities and infrastructure for implementation of the project activities. A lump-sum amount of Rs. 40.00 million has been estimated for the construction of office buildings under this project.

12 RISK MITIGATION PLAN

Overall, there is no risk in the project implementation as the project interventions are time tested and being implemented in the province since 1976. There exists sufficient poetical and capacity for implementing the envisaged interventions. The only risk may be untimely availability of project funds vis à-vis its transfer to the district which would be ensured through proper follow up at all levels.

13 CAPITAL COST ESTIMATES

13.1 Indicate date of estimation of project cost estimates

The cost estimates of the project have been prepared during January 2019.

13.2 Basis of determining the capital cost (market survey, schedule rates, estimation based on previous work done etc.)

Capital cost of the project is based on the prevailing average market rates of various items available in the open market during January 2019 in the Punjab.

13.3 Year-wise/Component-wise Phasing of Physical Activities

The year-wise/ component-wise phasing of physical targets/activities of the project is enclosed (**Annexure-J**). It is indicated that the year-wise phasing of physical targets is indicative, which may be changed by the competent authority/ PSC based on availability of the resources.

13.4 Year-wise/Component-wise Financial Requirements

The year-wise/ component-wise phasing of financial requirements for project activities is provided (**Annexure-K**). The operational cost for provincial, divisional and district level OFWM offices and ABAD/ Directorate Soil Conservation and capacity building is attached as is attached as **Annexure-L (1-3)**.

14 ANNUAL OPERATING AND MAINTENANCE COST AFTER COMPLETION OF THE PROJECT

It is envisaged that the farmers/service providers would be responsible for the operation and maintenance of the LASER units and solar systems provided under the project. Moreover, LASER and solar supply & service companies would provide after sale follow-up service after delivery of LASER units and the solar systems. The service centers established by the private SSCs at district/ divisional level under the project would provide/facilitate technical services and maintenance facilities to the farmers. The farmers/water users would be responsible for successful operation & maintenance of farm pond, dugwell and improved watercourses.

It is indicated that the proposed technologies/ interventions have long life ranging from 10-20 years and farmers would need technical support even after project completion. The OFWM staff would provide technical support services to the farmers for sustainability of the envisaged works after project completion/ expiry of warranty period by the SSCs in case of LASER levelers and solar systems.

15 DEMAND AND SUPPLY ANALYSIS

The low irrigation efficiencies at the farm level are major constraint in attaining potential production from otherwise highly productive agricultural lands. As such, more than 40 percent of canal water is lost between water source and fields due to poor condition of water conveyance system (field watercourses). The crop water requirements are not met timely because of supply based irrigation water delivery, which negatively affects the overall agricultural production. Many researchers have found that a significant (20 to 25%) amount of irrigation water is lost during its application due to uneven fields and poor farm designing. This leads to excessive application to low-lying areas and under-irrigation of higher spots. Over-irrigation leaches soluble nutrients from the crop root zone, makes the soil less productive, and degrades groundwater quality. On the other hand, under-irrigation of elevated parts of the fields results in accumulation of salts in such patches besides causing water stress and injurious effects of applied fertilizer to the crops.

The existing initiatives are being successfully implemented and improvements being made are contributing significantly towards enhancing water productivity at the farm level. However, a holistic approach proposed under the project envisaging improvement of water availability at farm level by reducing conveyance losses, storage of excess water for irrigation during dry periods/ critical stages of crops and enhancement of water application efficiency by LASER land levelling of fields would be more effective.

16 FINANCIAL PLAN (FINANCING SOURCES)

a) **Equity**

NA

b) **Debt**

NA

c) **Grants alongwith Sources**

(Rs. in million)

Sources	Amount for Capital Cost	Amount for Recurring Cost
(a) Foreign Assistance	-	-
i- Loan	-	-
ii- Grant	-	-
iii- Technical Assistance	-	-
(b) Federal Government	-	-
i- Grant	942.877	-
ii- Loan	-	-
iii- Investment	-	-
iv- Direct Expenditure	-	-
(c) Provincial Government	-	-
i- Grant	1,592.926	-
ii- Loan	-	-
iii- Investment	-	-
iv- Direct Expenditure	-	-
(d) Sponsoring Agency's own fund	-	-
(e) Private Investment (SSCs)	-	-
(f) Local Body Resources, if any	-	-
(g) Non-Government borrowing	-	-
(h) Beneficiaries Contribution	1,176.840	-
(i) Other sources (e.g. Recoveries)	-	-

d) **Weighted Cost of Capital**

NA

17 FLOW OF FUNDS

The annual physical targets will be assigned by the Federal Steering Committee (FSC) to the Punjab for project components. The executing agency-wise/ district-wise distribution of physical targets and financial implications will be got approved from the Provincial Steering Committee (PSC) at the start of each financial year. The project funds from federal government will be transferred in the Account-I (Non Food) of the Punjab government for further release for various project activities. The estimated costs of operational expenses as well as civil works

(watercourse improvement, farm ponds and dug wells) at district level under the proposed project will be transferred from provincial Account-I to Cost Centers/ DDO Codes of respective executing agency/ DDA (OFWM) with the authorization of the Finance Department. The Deputy Director Agriculture (OFWM)/ competent authority will further release the funds into the joint account of concerned WUAs in three instalments on recommendations of Third Party Validation (TPV) Consultants as per approved criteria. Further release of funds from the joint account of WUAs will be regulated in accordance with already approved procedure by the Finance Department vide letter No. 1-1140-Agri(FD)/11-P-VIII dated 12-09-2017 (**Annexure-M**). The WUAs will procure the construction materials on the rates fixed by the District Rate Committee for the tehsil/cluster and carry out civil works under technical supervision of OFWM field staff.

An assignment account (local currency) will be opened in the name of Director General Agriculture (Water Management) Punjab/ Provincial Project Director with the authorization of the Finance Department after fulfilling the prescribed codal formalities for channelizing the payments to the SSCs for provision of LASER units and solar pumping systems, Third Party Validation (TPV) Consultants, training and capacity building of beneficiaries etc. The funds will be transferred into the assignment account from the funds released by the Federal and Punjab government out of PSDP and ADP, respectively. The funds for Extension and ABAD/ Soil Conservation components will be released into the cost centers/ DDO codes of concerned Directors Agriculture (Ext.) and ABAD/ Director Soil Conservation for further utilization.

18 PROJECT BENEFITS AND ANALYSIS

18.1 Financial Benefits

The project will have both tangible and intangible benefits but there will be no direct income from the scheme to the government. Increase in crop yields, cropping intensity, cropped area, better change in cropping pattern, good quality produce etc. resulting from implementation of envisaged interventions will, however, have an indirect impact on its income side. The same would result in substantial increase in farm returns and provide enhanced employment opportunities to the rural population of project area.

18.2 Economic Benefits

A great degree of confidence in attaining envisaged project benefits is based on demonstrated effects of proposed intervention in various countries with similar agro-climatic conditions of Pakistan/Punjab. Following positive outcomes are expected from the scheme.

- i) A more efficient, productive and sustainable water application system delivering greater development impact at lesser cost to the government budget as a result of community

participation.

- ii) Increased agricultural growth, poverty alleviation, and private sector development in rural areas where most of the absolute poor is inhibited.
- iii) Substantial contribution in GDP due to higher agricultural output and greater rural employment.

The Project would have a significant impact on Punjab's irrigated agriculture sector, by cutting down the water losses and introducing technologies, which help in water conservation and increased productivity of water. It is quite challenging to fully capture and quantify the benefits of such intervention in sector like agriculture in which many factors are at play. Therefore, a simplified approach is used to estimate the incremental benefits of the project and benefit-cost analysis & internal rate of return (IRR) have been worked out. The same has been got cleared by the Risk Analyst of P&D Board and enclosed herewith (**Annexure-N**).

18.3 Social Benefits

Improvement of water availability at the farm level with water storage ponds and dugwells, irrigation water saved through reduced conveyance losses in the improved watercourses, coupled with modern technologies (solar water pumping and high efficiency irrigation systems) and LASER land leveling would increase the irrigated cropped area, crop yields, cropping intensity and farm incomes in the project area. Accordingly, increased income level of the farming community will improve livelihood in the project area.

18.4 Environmental Benefits/ Impact Assessment

Various project impact evaluation studies were carried out to assess the effects of different OFWM interventions such as watercourse improvements and LASER land leveling. These studies clearly indicated that the improvements in water conveyance and application efficiency have positive effects in controlling waterlogging and rising watertable, improving water management, reducing the drainable surplus, and minimizing soil salinity risks.

The project builds on existing infrastructure and improves system operations. As such, it would, not experience adverse environmental effects normally associated with new developments, such as resettlement, depletion of land and water resources, and loss of wildlife habitat. In addition to reducing the problems of waterlogging and salinity, improved water management would reduce incidence of mosquito-borne diseases by reducing the habitat of mosquitoes with reduction in stagnant water leaking from deteriorated water channels.

18.5 Employment Generation

Implementation of the project would provide enhanced employment opportunities, particularly to the rural population of project area. About 1,000 persons will be directly engaged

as operators and helpers in operation of LASER land leveling units and 1,216 persons will be engaged as operators in operation of solar pumping systems at farm pond and dugwell sites. As such, there will be about 86,000 total beneficiaries including 12,000 direct and 74,000 in-direct beneficiaries of the project. The area benefitted after the project completion would be about 150,000 acres (60,000 ha). Furthermore, marketing and repair facilities of these systems will be established in the private sector throughout the province that will open new avenues of employment for skilled workers. Moreover, employment opportunities will become available for skilled and unskilled labor during execution of project activities. Improvement in crop yields will also boost economic activity in rural areas of the province that will create further employment options. It is estimated that an amount of about Rs. 1,176.840 million would be contributed by farmers as cost sharing under the project. It is, therefore, concluded that project implementation will stimulate employment generation not only for skilled and unskilled labor in the villages but will help in opening of new earning opportunities in the rural sector.

18.6 Sensitivity Analysis on Project Cost/Viability

The escalating surface water shortages, depleting groundwater aquifers, and mining of subsurface water resources due to over exploitation necessitate immediate adoption of water conservation technologies for efficient utilization of limited water resources. Any delay in implementation of proposed interventions would result in irreversible losses besides increase in project costs due to price escalation of equipment/materials. The sensitivity analysis has been done for the case if the costs of the project activities are increased by 10% and benefits of the project activities are reduced by 10% because of delay in implementation activities.

19 IMPLEMENTATION SCHEDULE

The starting and completion dates of the project are given below.

Starting Date	Completion Date
1 st July 2019	30th June 2024

The implementation plan for proposed project activities has also been prepared and enclosed (**Annexure-O**). It is indicated that about six (6) months for project closing/certification of works by the project consultants i.e. upto 31-12-2024 would be finalized (if required) after consultation with the Federal and provincial governments.

20 MANAGEMENT STRUCTURE AND MANPOWER

20.1 Existing Facilities

On Farm Water Management (OFWM) program in the Punjab is part of the Provincial Agriculture Department headed by the Secretary Agriculture, Government of the Punjab. The program is planned, coordinated, supervised, and operated by Director General Agriculture (Water Management) at provincial level who is assisted by the Director (Headquarters) and Director (Training). OFWM functions were devolved to District Governments on promulgation of Devolution Plan 2001. Under this set-up, offices of District Officers (OFWM) were established in all 36 districts of the province to supervise OFWM activities and offices of Deputy District Officers (OFWM) were created for physical execution of works at tehsil level as the lowest tier of OFWM administrative system. It is indicated that previous nomenclature of the posts of EDO (Agriculture), DO (OFWM) and DDO (OFWM) have been changed to Director Agriculture (OFWM), Deputy Director Agriculture (OFWM) and Assistant Director Agriculture (OFWM), respectively on promulgation of Punjab Local Government Act, 2013.

The Water Management Training Institute (WMTI) Lahore has been providing training and capacity building support to various stakeholders of water management including the professionals, sub-professionals, farmers, employees of private sector firms and consultants. A Water Management Research Farm under the supervision of Deputy Director (Farms) is being developed on 30 hectares (75 acres) land for evaluation, indigenization, standardization and demonstration of new water management interventions.

20.2 Project Implementation and Coordination Arrangements

The project will primarily be implemented with existing infrastructure and human resource base of Agriculture Department. The governments' over all policy under Punjab Local Government Act, 2013 would be adopted for executing the envisaged interventions. The major project activities regarding water storage pond, dugwell and watercourse improvement component will be implemented through well established and time tested farmers' institution of Water Users Association (WUA) whereas, private firms/ SSCs will be engaged for provision of solar pumping system, LASER land leveling units and supply of PCPS for watercourse lining.

20.3 Project Implementation and Human Resource Management

Planning and Development Department (P&DD) is the apex organization at provincial level responsible for preparing overall development framework, coordination & monitoring of development programs, and provision of assistance to various departments for planning &

executing development activities. Agriculture Department is responsible for agricultural development in the province through introduction of new technologies and provision of support services to the farmers for better crop production. This project will continue to be over seen and monitored by P&DD, Punjab. It will be coordinated, and managed by the Agriculture Department through its Water Management wing. The program will be supervised, coordinated, and operated by the Directorate General Agriculture (Water Management) Punjab, Lahore. Director General Agriculture (Water Management) would also act as the Provincial Project Director of the project. The district and tehsil level OFWM staff as well as WUAs & private sector service providers/ SSCs will be the executing agencies with technical assistance and support of OFWM staff, and the project consultants.

20.4 Provincial Supervision, Management and Monitoring

Director General Agriculture (Water Management), Punjab would continue to be the Project Director and Coordinator, who will be responsible to supervise, manage and monitor the proposed project from provincial headquarters through existing establishment.

20.5 Divisional Project Coordination Support

On promulgation of PLGA 2013, nine (9) Directorates Agriculture (OFWM) and Directorates Agriculture (Ext.) have been established at divisional level (Lahore, Multan, Rawalpindi, Sahiwal, Sargodha, Faisalabad, Gujranwala, D.G. Khan and Bahawalpur) to supervise OFWM/ Extension activities and the concerned Divisional Directorate would provide necessary technical support to the district offices as well as coordinate between provincial headquarters and field formations in the project area during execution of the project activities. Directorate Soil Conservation, Rawalpindi will coordinate for implementation of the assigned project activities.

20.6 District and Tehsil Offices

Deputy Director Agriculture (OFWM), would be responsible for supervision, coordination and internal monitoring at district level. This office would implement the watercourse improvement, construction of farm ponds, LASER land leveling activities and installation of solar pumping systems.

Assistant Director Agriculture (OFWM) at tehsil level is the functional tier of OFWM organizational setup for implementation of proposed works. Offices of ADA (OFWM) have been established in all 126 tehsils under non-development budget. The field activities under the project will be executed by the ADA (OFWM) of the concerned tehsil of the project area for which targets will be assigned to each tehsil. It is planned that all the project activities will be

carried out by the existing OFWM staff and resources. The proposed institutional setup of OFWM for the implementation of project activities is enclosed (**Annexure-P**). Directorate Soil Conservation, Rawalpindi will implement the assigned project activities through existing field formation at district level.

21 PROJECT MANAGEMENT

The coordination, administration, and monitoring for successful execution of envisaged activities under the proposed project will be achieved through establishment of following committees.

- i). Federal Policy Guideline Committee (FPGC)
- ii). Federal Steering Committee (FSC)
- iii). Federal Coordination Committee (FCC)
- iv). Provincial Steering Committee (PSC)
- v). Provincial Implementation Committee (PIC)
- vi). District Implementation Committee (DIC)
- vii). District Allotment Committee (DAC)
- viii). District Rate Committee (DRC)

21.1 Federal Policy Guideline Committee

Policy Guideline Committee at federal level comprising of followings will provide guidelines to the Federal Steering Committee for implementation of the project.

- i) Minister for National Food Security & Research (MNFS&R)
- ii) Secretary, MNFS&R
- iii) Secretary, M/o Finance.
- iv) Secretary, M/o Planning, Development & Reforms Division
- v) Any other coopted member.

21.2 Federal Steering Committee

At federal level, Federal Steering Committee (FSC) would provide administrative and financial policy guidelines and approve annual plans at the highest level. FSC would be chaired by the Secretary, Ministry of National Food Security & Research and it would have membership from the Ministries of Finance, Planning, Accountant General and Auditor General of Pakistan, Provincial Planning & Development Departments, Provincial Coordinators/ Provincial Project Director and Director General, Federal Water Management Cell (FWMC) of Ministry of National Food Security & Research. The Director General (FWMC)/National

Program Coordinator (NPC) would look after day to day matters of implementation at the federal level and FWMC will act as the secretariat of FSC. FSC would meet annually and also as and when necessary. The FSC will consist of the following members.

- | | |
|--|------------------|
| 1. Secretary
Ministry of National Food Security & Research
Islamabad | Chairman |
| 2. Secretary
Planning, Development & Reforms Division,
Islamabad | Member |
| 3. Additional Finance Secretary (Budget)
Finance Division, Islamabad | Member |
| 4. Accountant General of
Pakistan Revenues, Islamabad | Member |
| 5. Representative from
Office of Auditor General of Pakistan | Member |
| 6. Additional Chief Secretaries Sindh,
NWFP, Balochistan and Chairman
Planning and Development Board
Punjab/ Agriculture Secretaries of Provinces | Members |
| 7. D.G(FWMC)/ NPC, MNFS&R | Member/Secretary |

21.3 Federal Coordination Committee

The Federal Coordination Committee (FCC) would be chaired by the Director General NPC, Federal Water Management Cell with Provincial Director Generals/ Director/ Coordinators as members. The Director Coordination (Headquarters), FWMC would act as Secretary of the Committee. The FCC would meet at least every three months, or whenever issues requiring resolution are submitted for its consideration.

The major functions to be performed by the Federal Coordination Committee would be, interalia, as follows.

- i) Coordinate inputs from the participating agencies at the federal level and in the field.
- ii) Approve and revise (if needed) Annual Work Plan of the project.
- iii) Periodically review the project implementation status, progress, and take necessary actions to overcome deficiencies.

21.4 Provincial Steering Committee

The Provincial Steering Committee (PSC) would provide policy guidance for project implementation by providing inter-agency coordination at the highest level. The PSC would be chaired by the Secretary Agriculture with representatives of Federal Water Management Cell, Planning & Development, Irrigation, Finance Departments, Director General Agriculture

(Field), Director General Agriculture (Extension & AR) and Director General ABAD as its members. The Director General Agriculture (Water Management)/ Provincial Project Coordinator will be the Secretary/Member of the PSC. The PSC may meet quarterly or earlier, if necessary. Once the project has set its pace, the PSC meeting may be held a minimum twice a year or earlier, if needed. The major functions to be performed by the PSC would be, interalia, as follows.

- i. Approve annual work plan, distribute targets among executing agencies and streamline flow of funds
- ii. Monitor physical and financial progress
- iii. Approve/ amend/ change the criteria's for selection of beneficiaries under various project components, if required.
- iv. Identify the constraints in achieving targets and devise strategies for their redressal
- v. Review provincial/district monitoring reports and take appropriate actions
- vi. Constitute committee(s) for approval of equipment standards & specifications, prequalification of supply & services companies for LASER land leveling units, supply of PCPS etc., preparation of technical proforma etc.
- vii. Formulate committee(s) to resolve specific issues relating to civil works, unspent funds, rates of construction materials, and make recommendations
- viii. Ensure implementation of decisions of Federal Steering Committee
- ix. Devise mechanism for transparent monitoring of project activities
- x. Make necessary modifications/ improvements in project implementation modalities including cost sharing, flow of funds, inter-component physical & financial adjustments etc. for smooth execution of project interventions.

21.5 Provincial Implementation Committee

The Provincial Implementation Committee (PIC) would be chaired by the Director General Agriculture (Water Management)/ Provincial Coordinator with ABAD/ Director Soil Conservation Punjab (Rawalpindi), concerned Directors Agriculture (Headquarters), Extension wing and all Deputy Directors Agriculture (OFWM) as its members. The Director (Headquarters) OFWM would act as Secretary of the committee. The Provincial Implementation Committee would meet every month to review the physical and financial progress as well as to suggest means to overcome the constraints faced in the field execution of project activities. The major functions of PIC would be as follows.

- a) Prepare annual work plan
- b) Review physical and financial progress.
- c) Identify the constraints in achieving targets and devise strategies for their redressal.
- d) Ensure implementation of decisions of Provincial Steering Committee.
- e) Coordinate and supervise the program activities.
- f) Review the provincial/district monitoring report and rectifications of the shortfalls.

21.6 District Implementation Committee

A District Implementation Committee (DIC) comprising the following would be constituted in each district to implement the program at district level as per plan.

▪ Deputy Commissioner	Chairman
▪ Additional Deputy Commissioner (Finance & Planning)	Member
▪ Director Agriculture (OFWM)	Member
▪ Director Agriculture (Ext.) concerned	Member
▪ Representative of Revenue Department	Member
▪ Representative of ABAD/ Director Soil Conservation Punjab	Member
▪ Deputy Director Agriculture (Ext.)	Member
▪ Deputy Director Agriculture (OFWM)	Member/Secretary

The DIC is proposed to meet on monthly basis. The major functions of DIC are as follows.

- a. Review physical and financial progress.
- b. Ensure effective implementation of program.
- c. Oversee proper flow of funds to WUAs.
- d. Arrange transparent internal monitoring.
- e. Make recommendation to PIC for improving pace of implementation.
- f. Resolve field dispute/ issues locally to ensure smooth implementation of project activities.

21.7 District Allotment Committee

The District Allotment Committee (DAC) comprising the following officers carry out allotment of LASER units to the farmers/ service providers at district level.

1. Deputy Commissioner	Chairman
2. Additional Deputy Commissioner (F&P)	Member
3. Director Agriculture (OFWM) concerned	Member
4. Additional District Collector	Member
5. Representative of DGA (WM)	Member
6. Deputy Director Agriculture (OFWM) concerned	Member/Secretary

The TORs of DAC include, interalia, the followings.

- i) Supervise publicity campaign to create awareness amongst farming community about the benefits/ impact of LASER land leveling technology, facility of government for purchase of LASER units, eligibility criteria, and procedure for grant of financial assistance under the scheme to ensure massive response from all union councils/ tehsils of the district.
- ii) Review issuance of application forms to all interested farmers/ service providers and receipt of completed application forms as per notified schedule.
- iii) Get the applications scrutinized by the designated committee viz-a-viz approved criteria.

- iv) Inform the ineligible applicants about rejection of their applications and decide the eligibility/ ineligibility after hearing appeals within stipulated timeframe.
- v) Convey the number of eligible applicants alongwith their complete list to the Director General Agriculture (Water Management) Punjab for confirmation of district quota of LASER units for specific year.
- vi) Finalize allotment of LASER units to eligible applicants (covering each tehsils/union council) according to available quota for the district through balloting, if necessary as well as maintain waiting list for each tehsil.
- vii) Issue allotment letters to successful applicants with the advice purchase the LASER units from the pre-qualified supply & service company (SSC) of the choice as per approved procedure.
- viii) Make allotments to next eligible applicants in the waiting list against the allottees failing to purchase the LASER units within specified timeframe.
- ix) Organize workshops for demonstration of equipment by pre-qualified SSCs to facilitate allottees to select the SSC/equipment of their choice.
- x) Monitor delivery of LASER units to the farmers/ service providers and get verifications of the supplied units against approved standards & specifications carried out by the designated committee.

21.8 District Rate Committee

The District Rate Committee (DRC) comprising the following officers will fix the rates of construction materials (sand, cement, bricks, pre-cast concrete parabolic segments, soil excavation etc.) for improvement of watercourses in canal commands/ outside canal command.

- | | |
|---|------------------|
| a) Director Agriculture (OFWM) of respective Division | Chairman |
| b) XEN Building Department | Member |
| c) Field Engineer (Consultant) | Member |
| d) Deputy Director Agriculture (OFWM) concerned | Member/Secretary |

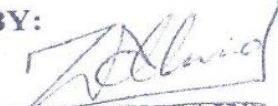
The terms and reference of the DRC include, interalia the followings.

- i. Periodically review rates of various construction materials
- ii. Fix price band for different materials for clusters on geographical basis
- iii. Fix rates for excavation, geomembrane laying/ jointing and earthen covering (clay) for construction of water storage ponds


CERTIFICATE

Certified that the project proposal has been prepared in the light of instructions provided by the Planning Commission for the preparation of PC-I for production sector projects.


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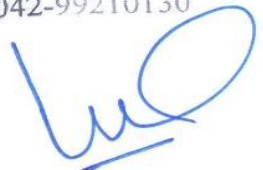

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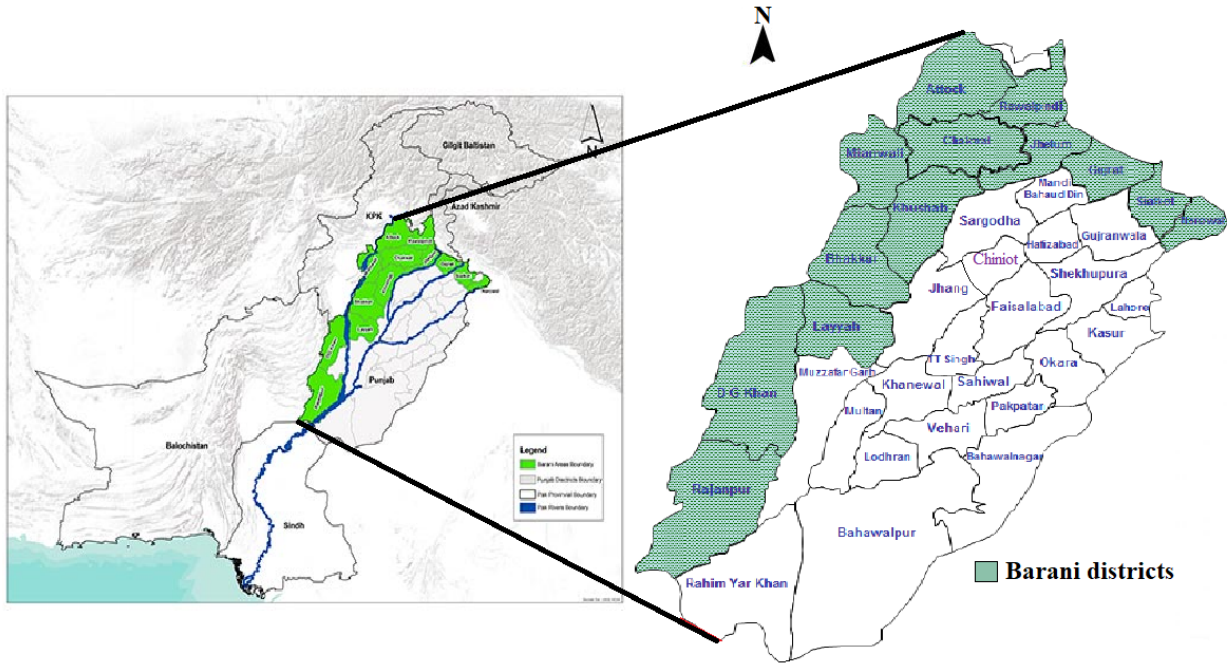

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ANNEXES

Annexure-A

National Program for Enhancing Command Area of Small and Mini Dams in Barani Areas of Pakistan - (The Punjab Component)

Map of the Project Area



Note: The shaded districts including Attock, Rawalpindi, Chakwal, Jhelum, Gujrat, Sialkot, Norowal, Khushab, Mianwali, Bhakkar, Layyah, Dera Ghazi Khan and Rajanpur districts of the Punjab province are project area.

National Program for Enhancing Command Area of Small and Mini Dams in Barani Areas of Pakistan (The Punjab Component)

Unit Cost Breakup of Farm Pond

1-Estimated earth works

Sr. No.	Particulars	Measurements (m)	Quantity (m ³)
1	Excavation and compaction of toe walls	(1)-One wall (1x9x1 = 9)	
		(2)-Two walls (2x9x1x1 = 18)	
		(3)-U/S spill way (15x9x0.50 = 67.5)	
		(4)-Top spill way (4x1.5x9 = 54)	
		(5)-D/S Spill way (15x9x0.50 = 67.5)	
		(6)-Stilling Basin (5.5x9x0.50 = 24.75)	9+18+67.5+54+67.5+24.75 = 240.75
2	Embankment work with compaction and dressing	4x5x46 = 920	1725+920+1725 = 4,370
		1/2x15x5x46 = 1,725	Shrinkage @ 3% = 4370x0.03 = 131
		1/2x15x5x46 = 1,725	Total = 4370+131 = 4,501
3	Any other earth work	-	-

2-Estimated civil works

1	Up side Toe wall of pond	1x1x8 = 8	8
2	Down side Toe walls of pond	1x8x1.5 = 12	17.6
		1x8x0.70 = 5.6	
3	Bed of spillway structure	15x8x0.45 = 54	54+10.8+54+19.8 = 138.6
		3x8x0.45 = 10.8	
		15x8x0.45 = 54	
		5.5x8x0.45 = 19.8	
4	Side walls of spillway Structure	2x25.4x1x1 = 50.8	50.8
5	Wire crates	238 wire crates of 4 m ² area	238x4 = 950 m ²
		51 wire crates of 6 m ² area	51x6 = 306 m ²
			(950+306) = 1256 m ²
6	Out-let pipe	33	33

3- Estimated costs of works

Sr. No.	Nature of works	Unit	Quantities	Unit Rate (Rs.)	Amount (Rs.)
1	Land Clearing	-	Lumpsum	-	7,500
2	Excavation in foundation and plinth	M ³	240	198.0	47,520
3	Embankment work with compaction and dressing	M ³	4,200	150.0	630,000
4	Toe walls stone masonry	M ³	25	1,750.0	43,750
5	Bed of spillway	M ³	100	1,111.0	111,100
6	Side walls of spillway	M ³	50	1,111.0	55,550
7	Stilling basin	M ³	19	1,748.0	33,212
8	Wire crates	M ²	1,100	200.0	220,000
9	PVC pipe 4" (D-class)	M	33	815.0	26,895
10	Carriage of stone	M ³	215	182.0	39,130
				Total	1,214,657

4. Cost Sharing

1	Government Share	60%	720,000
2	Farmer Share	40%	494,657
3	Total	100%	1,214,657

**National Program for Enhancing Command Area of Small and Mini Dams
in Barani Areas of Pakistan (The Punjab Component)**

Unit Cost Breakup of a Dugwell

Diameter of dugwell 12 ft.

Avg. depth of dugwell 50 ft.

1. Cost of works

Sr. No.	Items	Unit	Quantity	Rate (Rs.)	Total Amount (RS.)
1	Excavation of Well upto 20 ft. depth from ground level and disposal of soil	cft	3532	4.5	15,894
2	Providing and Fixing Structural Steel cutting edge in well curb L-Iron size 3" x 3" x 3/8"	kg	116	110	12,760
3	Fabrication of mild steel for R.C.C including cutting, bending, lying in position including bending wire and labor charges (vertical, spiral,	kg	307	45	13,815
4	Providing, making and lying R.C.C well curb in position ratio (1:2:4)	cft	55	345	18,975
5	Brick Masonary Work 1.5' Thick Wall 20' and 1.13' Thick Wall 26.5'				
	(i) 3.141 x 13.5 x 1.5' x 20' = 1,272	cft	1272	185	235,320
	(ii) 3.141 x 13.5 x 1.12' x 26.5' = 1,235	cft	1235	185	228,475
	Dry sinking upto 20-35 ft depth	cft	2650	45	119,250
5	Dry sinking upto 35-50 ft depth	cft	2650	60	159,000
6	Providing and fixing angle iron and fixing cross R-joints, flanges	Lumpsum		5,000	5,000
	Total Costs				808,489

2. Cost Sharing

i.	Government Share	60%	480,000
ii.	Farmers' Share	40%	328,489
	Total	100%	808,489

National Program for Enhancing Command Area of Small and Mini Dams in Barani Areas of Pakistan (The Punjab Component)

Unit Cost Breakup of Solar Pumping System for Farm Pond (7.5 kW)

1. Equipment and Services Cost

Section No.	Component	Characteristic	Details	Quantity	Cost	Total Cost
1	PV Module	Manufacturer Name	0	24	56	430,080
		Model No.	0			
		Series Type (Poly/Mono 60/72 cells)	72 Cells			
		Pmax (Wp)	320			
2	Pump Controller/Variable Frequency Drive	VFD Brand Name	0	1	200,000	200,000
		Model No.	0			
		Selected VFD size (kW)	7.5			
3	Remote Monitoring System	Manufacturer Name	0	0	0	0
		Model No.	0			
		Serial No.	0			
4	Solar Panel Array Structure with civil work	Brand Name		3	80,000	240,000
5	Electrical Cables	Brand Name of AC Cables		30	440	13,200
		Size (m)	6mm, 3 Core			
		AC cable Voltage Rating (V)	600~1000VDC			
		Brand Name of DC Cable		150	245	36,750
		Size (m)	6mm, Single Core			
		DC cable Voltage Rating (V)	600~1000VDC			
6	Solar Pump with Motor	Grundfoss	7.5HP	1	110,000	110,000
7	Power Disconnect (Circuit Breaker, Breaker Box and Changeover Switch)	Brand name for AC Breaker	Schneider/ABB/Equivalent	1	3,510	3,510
		Rating in Units	32AAC			
		Poles	3			
		Brand name for DC Breaker	Schneider/ABB/Equivalent	2	6,626	13,252
		Ratings in Units	16ADC			
		Poles	2			
		Breaker Box	Local	1	6,000	6,000
Changeover Switch	Local	1	6,000	6,000		
8	Earthing & Grounding (According to Electricity act of Pakistan) including borehole, earthing rod, earthing powder etc.	-	-	1	per site	20,000
9	Survey, Design & Estimate	-	-	-	10,000	10,000
10	Transportation	-	-	1	25,000	25,000
11	Installation	-	-	1	30,000	30,000
12	Post Installation O&M	-	-	5%	57,190	1,200,982

2. Cost Sharing

i.	Government Share	60%	720,000
ii.	Farmers' Share	40%	480,982
	Total	100%	1,200,982

National Program for Enhancing Command Area of Small and Mini Dams in Barani Areas of Pakistan (The Punjab Component)

Unit Cost Breakup of Solar Pumping System for Dugwell (5.5 kW)

1. Equipment and Services Cost

Section No.	Component	Characteristic	Details	Quantity	Cost	Total Cost
1	PV Module	Manufacturer Name	0	16	56	286,720
		Model No.	0			
		Series Type (Poly/Mono 60/72 cells)	72 Cells			
		Pmax (Wp)	320			
2	Pump Controller/Variable Frequency Drive	VFD Brand Name	0	1	150,000	150,000
		Model No.	0			
		Selected VFD size (kW)	5.5			
3	Remote Monitoring System	Manufacturer Name	0	0	0	0
		Model No.	0			
		Serial No.	0			
4	Solar Panel Array Structure with civil work	Brand Name		2	80,000	160,000
5	Electrical Cables	Brand Name of AC Cables		30	440	13,200
		Size (m)	6mm, 3 Core			
		AC cable Voltage Rating (V)	600~1000VDC			
		Brand Name of DC Cable		90	245	22,050
		Size (m)	6mm, Single Core			
DC cable Voltage Rating (V)	600~1000VDC					
6	Solar Pump with Motor		5.5HP	1	70,000	70,000
7	Power Disconnect (Circuit Breaker, Breaker Box and Changeover Switch)	Brand name for AC Breaker	Schneider/ABB/Equivalent	1	3,510	3,510
		Rating in Units	16AAC			
		Poles	3			
		Brand name for DC Breaker	Schneider/ABB/Equivalent	1	6,626	6,626
		Rating in Units	16ADC			
		Poles	2			
		Breaker Box	Local	1	6,000	6,000
Changeover Switch	Local	1	6,000	6,000		
8	Earthing & Grounding (According to Electricity act of Pakistan) including borehole, earthing rod, earthing powder etc.	-	-	1	per site	10,000
9	Survey, Design & Estimate	-	-	-	5,000	5,000
10	Transportation	-	-	1	10,000	10,000
11	Installation	-	-	1	20,000	20,000
12	Post Installation O&M	-	-	5%	38,455	807,561

2. Cost Sharing

i.	Government Share	60%	480,000
ii.	Farmers' Share	40%	327,561
	Total	100%	807,561

**National Program for Enhancing Command Area of Small and Mini Dams
in Barani Areas of Pakistan (The Punjab Component)
Already Approved Standards & Specifications of Solar Equipment
(Polycrystalline 60 cell series)**

Sr. No.	Item/Feature	Specification
	<i>Application</i>	<i>To absorb the sunlight as a source of energy to generate electricity</i>
1	<i>Capacity and series type</i>	<i>250 to 290-Watt Poly 60 cell series</i>
2	<i>Solar Cell</i>	<i>Polycrystalline silicon</i>
3	<i>Module Efficiency</i>	<i>≥15.5 %</i>
4	<i>Power tolerance</i>	<i>Positive tolerance only</i>
5	<i>Operating temperature</i>	<i>from -20° to +80° Celsius</i>
6	<i>International standards compliance</i>	<i>IEC61215:2005, IEC61730-1-2. Valid TUV Certification.</i>
7	<i>Identification</i>	<i>Barcode</i>
8	<i>Labeling & Import Data</i>	<i>Name of Manufacturer, Unique Model Number and Serial Number, Maximum Performance Pmax, Maximum Power voltage Vmp, Maximum Power Current Imp, Open Circuit Voltage Voc, Short Circuit current Isc, Month and year of manufacturing (the age of the module must not be more than one year at the time of installation)</i>
9	<i>Junction Box</i>	<i>PVC</i>
10	<i>Junction Box Standard</i>	<i>IP67 and above</i>
11	<i>Performance Warranty</i>	<i>25 years i.e, insurance backed warranty (Manufacturer warranty on letter head), global irrevocable and immediate insurance-backed with 3rd party policy rights of operation. Performance warranty will be linear.</i>
12	<i>Materials and workmanship warranty</i>	<i>10 years Free</i>
13	<i>Power Output Warranty</i>	<i>Power output within 10 years Shall not fall below 90%. Power output within 25 years Shall not fall below 80%.</i>
14	<i>Degradation</i>	<i>Panels should be Potential Induced Degradation (PID) free/anti PID / PID resistant</i>
15	<i>Origin</i>	<i>Imported Tier 1 Manufacturer</i>
16	<i>Temperature Coefficient of Maximum Power (Pmax)</i>	<i>≤ -0.43% / °C</i>
17	<i>Minimum efficiency at 200W/m2 (25°C, AM 1.5)</i>	<i>Equal to or more than 95% of the module efficiency at STC</i>
18	<i>Connector</i>	<i>MC4 equivalent connectors</i>

**National Program for Enhancing Command Area of Small and Mini Dams
in Barani Areas of Pakistan (The Punjab Component)
Already Approved Standards & Specifications of Solar Equipment
(Polycrystalline 72 cell series)**

Sr. No.	Item/Feature	Specification
	Application	To absorb the sunlight as a source of energy to generate electricity
1	Capacity and series type	300 to 360-Watt Poly 72 cell series
2	Solar Cell	Polycrystalline silicon
3	Module Efficiency	≥16 %
4	Power tolerance	Positive tolerance only
5	Operating temperature	from -20° to +80° Celsius
6	International standards compliance	IEC61215:2005, IEC61730-1-2. Valid TUV Certification.
7	Identification	Barcode
8	Labeling & Import Data	Name of Manufacturer, Unique Model Number and Serial Number, Maximum Performance Pmax, Maximum Power voltage Vmp, Maximum Power Current Imp, Open Circuit Voltage Voc, Short Circuit current Isc, Month and year of manufacturing (the age of the module must not be more than one year at the time of installation)
9	Junction Box	PVC
10	Junction Box Standard	IP67 and above
11	Performance Warranty	25 years i.e, insurance backed warranty (Manufacturer warranty on letterhead), global irrevocable and immediate insurance-backed with 3 rd party policy rights of operation. Performance warranty will be linear.
12	Materials and workmanship warranty	10 years Free
13	Power Output Warranty	Power output within 10 years Shall not fall below 90%. Power output within 25 years Shall not fall below 80%.
14	Degradation	Panels should be Potential Induced Degradation (PID) free/anti PID / PID resistant
15	Origin	Imported Tier 1
16	Temperature Coefficient of Maximum Power (Pmax)	≤ -0.43% / °C
17	Minimum efficiency at 200W/m ² (25°C, AM 1.5)	Equal to or more than 95% of the module efficiency at STC
18	Connector	MC4 equivalent connectors

**National Program for Enhancing Command Area of Small and Mini Dams
in Barani Areas of Pakistan (The Punjab Component)
Already Approved Standards & Specifications of Solar Equipment
(Monocrystalline 60 cell series)**

Sr. No.	Item/Feature	Specification
	Application	To absorb the sunlight as a source of energy to generate electricity
1	Capacity and series type	250 to 290-Watt Mono 60 cell series
2	Solar Cell	Mono-crystalline silicon
3	Module Efficiency	≥16 %
4	Power tolerance	Positive tolerance only
5	Operating temperature	from -20° to +80° Celsius
6	International standards compliance	IEC61215:2005, IEC61730-1-2. Valid TUV Certification.
7	Identification	Barcode
8	Labeling & Import Data	Name of Manufacturer, Unique Model Number and Serial Number, Maximum Performance Pmax, Maximum Power voltage Vmp, Maximum Power Current Imp, Open Circuit Voltage Voc, Short Circuit current Isc, Month and year of manufacturing (the age of the module must not be more than one year at the time of installation)
9	Junction Box	PVC
10	Junction Box Standard	IP67 and above
11	Performance Warranty	25 years i.e, insurance backed warranty (Manufacturer warranty on letter head), global irrevocable and immediate insurance-backed with 3 rd party policy rights of operation. Performance warranty will be linear.
12	Materials and workmanship warranty	10 years Free
13	Power Output Warranty	Power output within 10 years Shall not fall below 90%. Power output within 25 years Shall not fall below 80%.
14	Degradation	Panels should be Potential Induced Degradation (PID) free/anti PID / PID resistant
15	Origin	Imported Tier 1
16	Temperature Coefficient of Maximum Power (Pmax)	≤ -0.43% / °C
17	Minimum efficiency at 200W/m ² (25°C, AM 1.5)	Equal to or more than 95% of the module efficiency at STC
18	Connector	MC4 equivalent connectors

**National Program for Enhancing Command Area of Small and Mini Dams
in Barani Areas of Pakistan (The Punjab Component)
Already Approved Standards & Specifications of Solar Equipment
(Monocrystalline 72 cell series)**

Sr. No.	Item/Feature	Specification
	Application	To absorb the sunlight as a source of energy to generate electricity
1	Capacity and series type	300 to 360-Watt Mono 72 cell series
2	Solar Cell	Mono-crystalline silicon
3	Module Efficiency	≥16.75 %
4	Power tolerance	Positive tolerance only
5	Operating temperature	from -20° to +80° Celsius
6	International standards compliance	IEC61215:2005, IEC61730-1-2. Valid TUV Certification.
7	Identification	Barcode
8	Labeling & Import Data	Name of Manufacturer, Unique Model Number and Serial Number, Maximum Performance Pmax, Maximum Power voltage Vmp, Maximum Power Current Imp, Open Circuit Voltage Voc, Short Circuit current Isc, Month and year of manufacturing (the age of the module must not be more than one year at the time of installation)
9	Junction Box	PVC
10	Junction Box Standard	IP67 and above
11	Performance Warranty	25 years i.e, insurance backed warranty (Manufacturer warranty on letter head), global irrevocable and immediate insurance-backed with 3 rd party policy rights of operation. Performance warranty will be linear.
12	Materials and workmanship warranty	10 years Free
13	Power Output Warranty	Power output within 10 years Shall not fall below 90%. Power output within 25 years Shall not fall below 80%.
14	Degradation	Panels should be Potential Induced Degradation (PID) free/anti PID / PID resistant
15	Origin	Imported Tier 1
16	Temperature Coefficient of Maximum Power (Pmax)	≤ -0.43% / °C
17	Minimum efficiency at 200W/m2 (25°C, AM 1.5)	Equal to or more than 95% of the module efficiency at STC
18	Connector	MC4 equivalent connectors

**National Program for Enhancing Command Area of Small and Mini Dams
in Barani Areas of Pakistan (The Punjab Component)**

Already Approved Standards & Specifications of Solar Equipment

Sr. No.	Item/Feature	Specification
1	Application	Converts D.C voltage to A.C voltage and regulates the functions of the pump
2	Standard Compliance	IP65 or above
3	Efficiency	≥95 %
4	Type	Wall mounted
5	Free warranty period	02 years from the date of certification including replacement and O&M service or more as provided by manufacturer
6	Built-in functions	Variable Frequency Drive. Automatic Start and Stop with any input power (solar, Grid and Generator). Self-diagnostic and self-Protection. Multi-string input with failure. Dry run protection detection. MPPT (Maximum Power Point Tracking).
7	Controls	Digital controls with complete protective functions. Instantaneous output status display (Speed / Power /Amps) etc. Intelligent Power module (IPM) with LED displays or external display through smart phone for operating system. Data logging (Optional). Ground fault monitoring. AC short circuit protection. Under/Over Voltage & Over Current protection. Low Voltage Disconnect (LVD). Overcharge Protection. Reverse Current Blocking.
8	Temperature range	-10° to + 60° Celsius
9	Rated output voltage	A.C and D.C rated voltage (single/three phase)/rated voltage matching with the motor.
10	Origin	Imported

National Program for Enhancing Command Area of Small and Mini Dams in Barani Areas of Pakistan (The Punjab Component)

Already Approved Standards & Specifications of Solar Equipment

Sr No.	Items/Feature	Specification
Submersible Pump		
1	Materials	Impeller=AISI304, Housing= AISI304, Shaft= AISI304 (Stainless steel)
2	Specific Speed	2900 rpm
3	Pump set efficiency	Greater than or equal to 55%
4	Performance tolerance Standard	ISO9906
5	Quality assurance	Third Party inspection / Testing report
6	Origin	Imported / Local
7	Discharge	As per site Requirement
8	Head	As per site Requirement
Motor		
1	Type	Submersible Motor
2	Materials	Stainless steel
3	Rated Voltage	220-240/380-440 V
4	Voltage Tolerance	± 5% Volt
5	Phase	Single/three
6	Connection Standard	DIN/NEMA
7	Ingress Protection	IP68 totally against the powder /the effects of the submersion to precise conditions of pressure
8	Cooling Method	Water Cooled
9	No of Poles	Two
10	Frequency	50Hz
11	Thermal Protection	PT100
12	Operational suitability	VFD Supported
13	Origin	Imported / Local
14	Warranty	Minimum 02 years or more

**National Program for Enhancing Command Area of Small and Mini Dams
in Barani Areas of Pakistan (The Punjab Component)**

Already Approved Standards & Specifications of Solar Equipment

Sr. No.	Items/Feature	Specification
Centrifugal Pump		
1	Materials	Impeller=Cast Iron, Housing= Cast Iron, Shaft= Stainless steel
2	Specific Speed	2900 rpm
3	Performance tolerance Standard	ISO9906
4	PN Rating	PN16
5	Connection Standard	DIN/NEMA
6	Quality assurance	Third Party inspection / Testing report
7	Efficiency	Greater or equal to 60 %
8	Origin	Imported/Local
9	Discharge	As per site Requirement
10	Head	As per site Requirement
11	Warranty	Minimum 02 years or more

All items/ products must be brand new with original packing

**National Program for Enhancing Command Area of Small and Mini Dams
in Barani Areas of Pakistan (The Punjab Component)
Already Approved Standards & Specifications of Solar Equipment**

Sr. No.	Items/Feature	Specification
Surface Motor		
1	Type	Surface Motor
2	Materials	Cast Iron/Aluminum
3	Specific Speed	2900 RPM
4	IE Efficiency	IE2 and above
5	Insulation Class	"F" The class F insulation system provides an exceptional margin of safety and ensures a longer thermal life even in abnormal operating conditions
6	Rated Voltage	220-240/380-440 V
7	Voltage Tolerance	± 5% V
8	Phase	Single/three
9	Ingress Protection	IP55 – Protection against the powder/Protect against water jets
10	Cooling Method	IC411 fan cooled
11	No of Poles	Two
12	IEC Standard	IEC 60034-30:2008/IEC 60034-2-1:2007
13	Operational suitability	VFD Supported
14	Frequency	50 Hz
15	Mounting	Foot Mounted
16	Efficiency	85% or more
17	Origin	Local/Imported
18	Warranty	Minimum 02 years or more

All items/ products must be brand new with original packing

**National Program for Enhancing Command Area of Small and Mini Dams
in Barani Areas of Pakistan (The Punjab Component)**

Already Approved Standards & Specifications of Solar Equipment

Sr. No	Item/Feature	Specification
1	Application	The structure carries solar modules straight to sunlight and provides manual tracking. 2 axis
2	Type	Ground mounted (Pole) with manual or automatic tracking
3	Material	Grade 60 Steel (for reinforcement of concrete only)
4	Galvanization	100 microns Hot Dipped Galvanization for mounting structure. All nuts and bolts installed to the whole structure must be of stainless steel. No drilling and cutting is allowed at site.
5	Quality Standard	ISO 9001
6	Wind bearing velocity	150 km/hr
7	Tracking options	Seasonal and daily variations
8	Civil Work	1:2:4 Concrete mixture (≥ 70 cubic.ft. for single pole having capacity to bear up to 3.4 KW solar array, maximum number of 10 panels on a pole). Base 5'x 5'x 1', Concrete block 3'x 3'x 5'. Shuttering of bricks/metallic for base and concrete block.
9	Top Structure	T-frame / middle pipe diameter 4", 3mm, 78 & 82 length with 2 angle adjusters of 3 holes. Side arms 2"x 2"x 5mm x 13feet or with horizontal pipe beams. Angle for PV adjustment 2"x2"x5mm, length depends upon panels or cam shaft provision for seasonal variations.
10	Base Plate	Base plate 15"x15", 16mm thickness with 4-arrays of 12"x4"x6mm thickness.
11	Main Pole	Main pipe diameter 5.5" (OD), 6mm thickness flange at 4 feet. 5-feet height. Flange with groove of 8mm with eight holes, with cap having 3mm thickness flange with 2 holes, with angle adjusters and pipe clips. Tracking of solar panels through groove surface (8 mm balls, 72 nos. minimum in groove). All nuts, bolts and other accessories to be of stainless steel. A piece of base plate equal to outer diameter of main pole will be removed and 360-degree welding of main pole to base plate will be done after fully inserting the main pole in the base plate.
12	Reinforcement Cage in civil work	4-J-bolts, 7/8" rod thickness, height 72", bend 06", 5 rings of 3/8" thickness, 12"x12" center to center
13	Warranty period	10 Years free
14	Anti-theft provisions	The mounting structure equipped with anti-theft screws/clamps to prevent removal of any element of the structure (optional)
15	Grounding & Earthing	The PV System and the entire structure shall be properly grounded according to Electricity Act of Pakistan. This is to ensure the requisite ohmic resistance and safety of the PV System along with connected electrical appliances.

Note: Structural Drawings are attached as minimum reference purposes as Appendix A. Minor variations are allowed subject to department's approval. In case major variations are required on site, the structural and mechanical drawings would be prepared by SSCs and afterwards these design parameters will be verified at site by the Dispute Resolution Committee.

**National Program for Enhancing Command Area of Small and Mini Dams
in Barani Areas of Pakistan (The Punjab Component)**

Already Approved Standards & Specifications of Solar Equipment

Sr. No	Item/Feature	Specification
1	Application	To carry current
2	Type	Single conductor type, 99.99% Copper, Cross-sectional area of 4 mm ² or higher, 1000 V / Class II (according to protection class II / 1000V, single core cable, tinned copper conductor, XLPE Insulation, double EVA jacket (resistant to heat and cold, resistant to ozone, UV, oil and chemicals), Temperature range: -40 to 90 ° C (Temperature Peak. allowable: 120 ° C), Halogen free. DC cables shall be suitable for the environmental conditions at the Project site, including UV protection and rodent protection.
3	Color Coding	Positive: Red or brown. Negative: Black or blue
4	Cable losses	Ohmic losses less than 1% for DC cables and 0.5% for AC cables
5	Cable binders	Cable, cable binders, clamps and other fixing material must also be UV-resistant, made of polyethylene.

**National Program for Enhancing Command Area of Small and Mini Dams
in Barani Areas of Pakistan (The Punjab Component)**

Already Approved Standards & Specifications of Solar Equipment

Sr. No	Item/Feature	Specification
1	Application	To connect and disconnect the power and to enclose them in proper housing
2	Ingress Protection	IP 54 or higher for breaker box
3	Voltage	Have voltage ratings greater than the maximum circuit voltage
4	Current	Have current ratings between 125% and 150% of the maximum design current for the circuit
5	Display	All power disconnect should include a clear visual indication of their state (ON/OFF or I/O)
6	Alternate source switch over	There must be a switch over to power the pumping system with grid or generator on request of farmer

National Program for Enhancing Command Area of Small and Mini Dams in Barani Areas of Pakistan (The Punjab Component)

Unit Cost Breakup of Watercourse (Pipe Lining)

1. Basic Parameters

Items	Unit	Qty
Area	Acre	10-15
Discharge	lps	(7-10)
Length of scheme	m	500
Pvc pipe 3"	m	490
GI pipe 3"	m	6
Sluice valves	No.	4
N.R.V	No.	1
Distribution points	No.	5



2. Estimated Cost of Materials

Items	Size	Unit	Qty	Unit Rate (Rs.)	Amount (Rs.)
Pvc pipe	3"	m	490	300	147,000
GI pipe	3"	m	7	1,110	7,770
Sluice valves	3"	No.	8	4,920	39,360
N.R.V	3"	No.	1	2,700	2,700
Valve socket	3"	No.	7	70	490
T. PVC	3"	No.	7	400	2,800
Bend PVC	3"	No.	7	105	735
M.S Bend	3"	No.	7	1,240	8,680
M.S flange	3"	No.	14	350	4,900
Solution	1 kg	No.	3	825	2,475
Gas kit	4"	No.	20	40	800
Centrifugal pump (Local)	4"x 3"	No.	1	45,000	45,000
Diesel engine CAM	(25 hp)	No.	1	90,000	90,000
V-Belt	72"	No.	3	300	900
Pulley	-	No.	2	1,000	2,000
Iron template for pumping unit		No.	1	15,000	15,000
Nut bolt	Kg	No.	12	210	2,520
Foundation bolts		No.	8	100	800
Suction pipe	4"	m	4	1,300	5,200
Foot valve brass	4"	No.	1	3,900	3,900
Total					383,030

3. Brick Works for Distribution Points

No. of Distribution points	7	No.	Total Volume (m ³)
Brick work volume	0.25	m ³	1.75
Concrete work volume	0.11	m ³	0.77

Items	Unit	Qty	Unit Rate (Rs.)	Amount (Rs.)
Bricks	No.	875	8.0	7,000
Cement	Bag	0.21	515	109
Sand	m ³	0.339	882	299
Crush	m ³	0.678	1,340	908
Total Brick Work				8,316
Total Material Cost				391,346

4. Labor + Pump & engine Cost (Farmer Share)

Items	Size	Unit	Quantity	Unit Rate (Rs.)	Amount (Rs.)
Excavation of trenches (370 m)		m ³	268	125.0	33,443
Laying and jointing of PVC pipes	3"	m	370	15.0	5,550
Laying and jointing of GI pipes	3"	m	6	60.0	360
Fixing of sluice valves and N.R.V		No.	4	475.0	1,900
Construction of Distribution points		m ³	1.8	1,875.0	3,375
Back filling		m ³	202	15.0	3,030
Fitting Charges of accessories Lump sum					11,371
Pumping unit fitting and foundation		No.	1	15,000.0	15,000
Pumping unit foundation stone masonry	2.5*2.5*1.5	m ³	1	30,000.0	30,000
Total					104,029
G. Total					495,375

5. Cost Sharing

Government Share	60%	300,000
Farmer Share (Labor + Remaining Cost)	40%	195,375
Total	100%	495,375

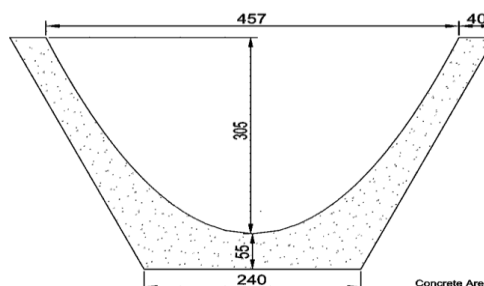
National Program for Enhancing Command Area of Small and Mini Dams in Barani Areas of Pakistan (The Punjab Component)

Unit Cost Breakup of Watercourse (PCPS Lining)

1. Cross Section of a Typical Watercourse

PCPS Segment # 2

Maximum height, D	360 mm
Maximum width, T	457 mm
Designed flow depth, d	305 mm



2. Basic Data of a Typical Watercourse to be Lined

Items	Unit	Quantity	Unit Volume (Cu.m)	Total Volume (Cu.m)
Area	Acres	15-25		
Design discharge	lps	28-45		
Average slope	m/m	0.0004		
Length of Lining	m	333		
Nakka structures	No.	15	0.38	5.70
Culvert	No.	2	3.00	6.00
Sign board	No.	1	0.50	0.50
Drop structure	No.	2	0.50	1.00
				13.20

3. Estimated Materials & Cost

Items	Unit	Quantity	Unit Cost (Rs.)	Total Cost (Rs.)
PCPL segments (#2)	No.	364	775 /Segment	282,222
Bricks	No.	6,600	6,500 /1,000	42,900
Cement (including Joints)	Bag	27	515 /bag	13,761
Sand (including in bed)	m ³	10	882 /m ³	9,195
Nakkas	No.	15	880 /nakka	13,200
Total Cost of Material				361,278
Material Cost per Running Meter (Rs.)				1,085

4. Cost of Labor & Masons (Farmers' Share)

Items	Labor (Rs.)	Masons (Rs.)	Total
Excavation/pad work back filling of section to be lined 370 meters section (0.2 men-days/meter @ Rs.400/man-days).	19,980		19,980
PCP Segments laying, jointing and back earth filling 370 meters) '@ Rs.300/meter.	41,625	49,950	91,575
Installation of 15 nakkas @ Rs. 500/- each	4,500	4,500	9,000
Construction of 2 culverts @ Rs. 9000/- each	9,000	9,000	18,000
Construction of 5 drop structures @ Rs. 900/- each	900	900	1,800
Construction, painting and writing of sign board @ Rs. 3,500/- each	1,750	1,750	3,500
Total Labor & Masons	77,755	66,100	143,855
G. Total			505,133

5. Cost Sharing

i. Government Share	60%	300,000
ii. Farmers' Share	40%	205,133
Total	100%	505,133

National Program for Enhancing Command Area of Small and Mini Dams in Barani Areas of Pakistan (The Punjab Component)

Unit Cost Breakup of Watercourse (Brick Lining)

1. Cross Section of a Typical Watercourse				
Lined Section Dimensions Depth = 40 cm Bottom Width = 48 cm Floor Thickness = 7 cm Wall Thickness = 23 cm				
2. Basic Data of a Typical Watercourse to be Lined				
Items	Unit	Qty	Unit Volume (m³)	Total Volume (m³)
Area	Acres	15-25		
Design Discharge	lps	28-45		
Average Slope	m/m	0.0004		
Length of Lining	m	300	0.2500	74.99
Nakka Structures (0.51 m dia)	No.	10	0.52	5.20
Culvert	No.	1	5.00	5.00
Sign Board	No.	1	0.50	0.50
Drop Structure	No.	2	0.25	0.50
				86.19
3. Estimated Materials & Cost				
Items	Unit	Qty.	Unit Cost (Rs.)	Total Cost (Rs.)
Bricks (500 Bricks per cubic meter)	No.	43,093	6,000 /1000	258,559
Cement (1.80 bags per cubic meter with Cement Sand Ratio 1:4)	bag	155	515 /bag	79,895
Sand (0.26 cubic meter per cubic meter)	m ³	22	875 /m ³	19,607
Nakkas	No.	10	850 /Nakka	8,500
Total Material Cost				366,561
Material Cost per Running Meter (Rs.)				1,222
4. Cost of Labour & Masons				
Items	Labor (Rs.)	Masons (Rs.)	Total (Rs.)	
Alternate irrigation channel for construction of lined section (0.2 men-days/meter @ Rs. 300/man-day)	18,000		18,000	
Excavation /pad work/backfilling of section to be lined (0.2 men-days/meter @ Rs.300/man-day)	18,000		18,000	
Construction of lined section @ Rs. 300/meter	45,000	45,000	90,000	
Installation of 15 nakkas @ Rs. 500/- each	2,500	2,500	5,000	
Construction of 2 culverts @ Rs. 9000/- each	4,500	4,500	9,000	
Construction of 2 drop structures @ Rs. 900/- each	900	900	1,800	
Construction, painting and writing of sign board @ Rs. 3,500/- each	1,750	1,750	3,500	
Total Labor & Masons	90,650	54,650	145,300	
G. Total			511,861	
5. Cost Sharing				
Distribution	Share			
Government share	60%		300,000	
Farmer share	40%		211,861	
Total	100%		511,861	

**National Program for Enhancing Command Area of Small and Mini Dams
in Barani Areas of Pakistan (The Punjab Component)**

District-wise LASER Leveler Requirement and Proposed Quota

Sr. No.	Division	District	Total Requirement of LASER units (Nos.)	Total LASER Units Delivered So Far (Nos.)	Balance Requirement on delivered basis (Nos.)	Quota (Nos.)
1	D.G.Khan	D.G.Khan	501	288	213	52
2		Layyah	615	327	288	71
3		Rajanpur	515	260	255	62
Total			1,631	875	756	185
4	Sargodha	Khushab	208	92	116	29
5		Bhakkar	618	306	312	76
6		Mianwali	398	181	217	53
Total			1,224	579	645	158
7	Gujranwala	Narowal	380	191	189	46
8		Sialkot	635	334	301	74
9		Gujrat	250	134	116	28
Total			1,265	659	606	148
10	Rawalpindi	Attock	20	8	12	3
11		Chakwal	15	5	10	2
12		Jhelum	15	7	8	2
13		Rawalpindi	10	2	8	2
Total			60	22	38	9
Total:-			4,180	2,135	2,045	500

**National Program for Enhancing Command Area of Small and Mini Dams
in Barani Areas of Pakistan (The Punjab Component)**

Unit Cost Breakup of LASER Land Leveling Equipment & Unit

S. No.	Item	Cost (Rs.)	
1	LASER unit with all accessories including Transmitter, Receiver, Control Box, Tripod Stand, Battery etc.		300,000
2	LASER Scrapper alongwith solenoid assembly		250,000
3	Cost of LASER Land Leveler		500,000
4	Cost of Tractor		1,100,000
5	Grand Total		1,600,000
Cost Sharing			
(i)	Government Share	16%	250,000
(ii)	Farmer Share	84%	1,350,000
	Total	100%	1,600,000

**National Program for Enhancing Command Area of Small and Mini Dams
in Barani Areas of Pakistan (The Punjab Component)**

THE EXTENSION COMPONENT

DIRECTORATE AGRICULTURE (EXT. & AR)

GOVERNMENT OF THE PUNJAB, AGRICULTURE DEPARTMENT

Objectives

The main objective of the project is to enhance the production of fruits, fodder and oilseed crops on sustainable and affordable prices in the command areas of mini dams in the project area. The detail of sub-objectives is as under:-

- 1) Establishment of Orchards
- 2) Promotion of Oilseed/ Pulses crops.
- 3) Enhancement of Fodder production.

The rising poverty, especially in rural areas poses serious concerns for policy makers. Social scientists link spreading poverty to the lack of employment opportunities and malnutrition. Whatever little is earned, is spent on food which is insufficient. Low intake of food nutrients affects the labour productivity thus resulting in lower economic growth rate. Technological developments demand a change from the existing traditional system of cropping to a more innovative and commercial farm business. It is perhaps time to bring about a major shift in our approach towards farming business keeping in view the challenges and prospects that will confront our country in future.

The issues of Barani Area of Rawalpindi, Gujranwala, Sargodha and D.G.Khan divisions are availability of water, small and scattered holdings, farmers with less resources and skilled labour. Different provincial agencies have developed water resources in the shape of mini dams and ponds. Irrigation department has also constructed more than 50 small dams in this area. By this project efforts will be made to develop the command area of these water resources by utilizing the precious water which is the only limiting factor hampering the productivity of different fruit plants and crops.

DESCRIPTION OF THE EXTENSION COMPONENT

Project Interventions

- 1) Establishment of fruit orchards.**
- 2) Promotion of Oilseed/ Pulses crops.**
- 3) Promotion of Fodder crops.**

Establishment of Orchards

Horticultural crops have significant potential in vertical as well as horizontal expansion along with enhanced employment opportunities for the rural poor masses including

women force working in the field for their livelihood. It contributes in poverty alleviation, nutritional security and have ample scope for farmers to increase their income and helpful in sustaining large number of agro-based industries which generate huge employment opportunities. The fruits which can successfully grown and included in this project are Olives, Citrus, Peaches, Grapes, Mango and Loquat, etc. Change in cropping pattern through high value crops like establishment of fruit orchards will be done through motivation, training and financial assistance to farmers. On potential sites minimum 1 acre of orchard would be established at each beneficiary farmer. The inputs would be provided by the department. The subsidy would be provided after verification of successful establishment of orchard in the field.

Promotion of Oilseed/Pulses Crops:

Pakistan despite being an agriculture country is below potential in agriculture sector, on various fronts. Regardless, the Government endeavors, the area under oilseed crops is minimal vis-a-vis country's requirements. Indigenous production of edible oil is only 12% and 88% of the demand is met through imports. Similar is the case with Pulses. Resultantly, Pakistan is spending a huge amount from its national exchequer on imports of edible oil and pulses. Therefore, it is high time; the country must augment their area under oilseed crops and pulses crops.

Oilseed crops are extremely vital for domestic oil production. Edible oil, extracted from oilseed crops has 2.5 times more energy than protein and carbohydrates. Edible oil from oil seed crops, being rich in essential: fatty acids, Vitamin D and E, having zero cholesterol and higher percentages of mono and poly unsaturated fats, are rightly preferred over ghee from animal source.

Pulses are part of a healthy, balanced diet and are a low fat source of protein, with a high fibre content and low glycemic index. Pulses provide important amounts of vitamins and mineral. Some of the key minerals in pulses include: iron, potassium, magnesium and zinc. Pulses are also particularly abundant in B vitamins; including folate, thiamin and niacin.

Barani areas of these divisions are the most suited venue to be chosen for oilseed crop production. Almost all oil seed crops can be grown in Barani region. Barani region upon receiving approximate annual rainfall up to 1000 mm has better Organic Matter status in its soil as compared with the rest of the soils of the province. Crops like Canola, Sunflower, Rapeseed-Mustard, sesame etc can be grown in the area. Mash crop has also potential to be grown in this part of the Punjab. The utilization of command area of Small dams and mini dams will be win-win situation both for local farmers and for the country as a whole. Potential sites will be selected and four acre of Oilseed/ Pulses crops would be established annually at each beneficiary site. Government will provide 100% subsidy.

Promotion of Fodder Crops:

The optimum benefit from precious water could not be achieved through traditional crops. To ensure financial feasibility of the farmer, the change in cropping pattern is desirable. This could only be done through introduction of fodder crops. Fodder crops are rich in Fibre,

digestible protein, minerals and vitamins required for balanced diet to animals. Fodders are cash crops for farmers and has multipronged importance among agricultural crops being sown in Barani region. It meets more than 50% of animal dietary requirements. It also restores fertility status of soil when it comes to leguminous fodder. To meet the increasing demand of forage for Livestock, it is need of the time to bring more area under fodder cultivation in order to overcome the forage scarcity period (May-June and October-December). Major fodder crops to be taken under this project will be Maize, Millet and Oats. Since, it requires extraordinary skills and also highly capital intensive activity so special efforts are required for its promotion. After the selection of potential sites two acre summer and two acre for winter fodder crops would be established keeping in view the suitability of the site whether it is located in the proximity of urban settlement or in remote area. Government will provide 100% subsidy.

Site Selection Criteria and Implementation Arrangements

- The land in command area is developed with availability of water conveyance system.
- The site selection criteria mainly encompass progressiveness, receptiveness and motivation level of the farmers / community group.
- The department will short list suitable sites where farmers will be found motivated, ready to adopt new technologies and take responsibility of operation and maintenance of the extended facilities.
- The report of the short listed sites will be submitted to Director Agriculture (OFWM) for deliberation and final selection of the project sites.
- The TOP defining the roles and responsibilities of the two parties will be signed between department and the beneficiary farmers to execute the project activities.

PROCEDURE FOR SUBSIDY DISBURSEMENT

The project will be implemented under the overall supervision and guidance of Director General Agriculture (Water Management). The funds of the project will be placed at the disposal of Director General Agriculture (Extension & AR) Punjab Lahore for further provision to the Directors of Agriculture Extension of project divisions for disbursement to the beneficiary farmers through Govt. Bank Drafts / Cheques in order to carry out the interventions of the project after completing all legal / procedural / codal formalities. Payment will be made in full / installments on work done basis following the procedure detailed as under:

- The beneficiaries will purchase the inputs from reliable sources by paying subsidized announced prices in cash against legal official receipt.
- The contents of receipt has to be got approved from the agriculture department.
- The department will pay subsidy amount on production of following documents:-
 - Legal official receipt
 - Documented confirmation of the plantation/sowing provided by the beneficiary himself under his own signatures. The signatures should be same as on CNIC and verified by the head of department of concerned district. The detail of particulars of confirmation document is as under:-
- Area sown/established

- Time of sowing/planting
- Kinds of crop/plant
- Signatures of Farmer as on CNIC
- Bills of cost will be reimbursed after verifications.

PROJECT STRATEGY

i. Project Implementation

Director General Agriculture (Ext. & AR) Punjab Lahore will be the overall in-charge of the project activities both for administrative and financial matters.

ii. Financial Management

Funds required to be spent under the project will be placed at the disposal of Directorate General Agriculture (Ext. & AR) Punjab Lahore.

The Project funds required to be spent at divisional level will be transferred to these Directorates.

iv. Targets of the Project

To promote fruit orchards, cultivation of oilseed/pulses and fodder crops in the command area of Small dams and mini dams in barani areas of the project districts/divisions for year round supply of fruits, fodder and edible oil at economical rates and make the farming sustainable/economical.

YEAR WISE ACTIVITIES TO BE TAKEN

☐ YEAR 2019-20

Establishment of fruit orchards

Cultivation of fodder crops

Cultivation of oilseed crops/pulses

☐ YEAR 2020-21

Establishment of fruit orchards

Cultivation of fodder crops

Cultivation of oilseed crops/pulses

☐ YEAR 2021-22

Establishment of fruit orchards

Cultivation of fodder crops

Cultivation of oilseed crops/pulses

☐ YEAR 2022-23

Establishment of fruit orchards

Cultivation of fodder crops

Cultivation of oilseed crops/pulses

□ **YEAR 2023-24**

Establishment of fruit orchards

Cultivation of fodder crops

Cultivation of oilseed crops/pulses

Capital cost estimates =Rs. 673.10 Million

Year wise, Component Wise and District Wise Physical Activities/Targets of the Project (Extension Component):-

Year Wise and District wise Physical Targets "NATIONAL PROGRAM FOR ENHANCING COMMAND AREA OF SMALL AND MINI DAMS IN BARANI AREAS OF PAKISTAN (EXTENSION COMPONENT)											
Establishment of Fruit Orchards											
Sr. No.	Name of Division	Name of District	No. of Mini Dams	No. of Ponds.	Area to be Allocated (Acre)	2019-20	2020-21	2021-22	2022-23	2023-24	Total
	Rawalpindi	Rawalpindi	547	378	1000	100	250	250	250	150	1000
		Chakwal	336	422	1500	150	400	400	400	150	1500
		Jhelum	332	420	1500	150	400	400	400	150	1500
		Attock	187	163	800	100	200	200	200	100	800
	Gujranwala	Gujrat	27	29	300	30	80	80	80	30	300
	Sargodha	Mianwali	37	11	200	20	50	50	50	30	200
		Khushab	13	94	400	50	100	100	100	50	400
	D.G. Khan	D.G. Khan	21	50	500	50	120	140	140	50	500
		Rajanpur	0	21	183	15	50	50	50	18	183
		TOTAL	1500	1588	6383	665	1650	1670	1670	728	6383

Year Wise and District wise Physical Targets for Allocation of Area Under Fruits Plants, Oil Seeds, Pulses and Fodder Crops											
Establishment of Oil Seed/Pulses Crops											
Sr. No.	Name of Division	Name of District	No. of Mini Dams	No. of Ponds.	Area to be Allocated (Acre)	2019-20	2020-21	2021-22	2022-23	2023-24	Total
	Rawalpindi	Rawalpindi	547	378	2000	200	500	500	500	300	2000
		Chakwal	336	422	3000	300	800	800	800	300	3000
		Jhelum	332	420	3000	300	800	800	800	300	3000
		Attock	187	163	2000	250	500	500	500	250	2000
	Gujranwala	Gujrat	27	29	1000	100	250	250	250	150	1000
	Sargodha	Mianwali	37	11	1538	150	400	400	400	188	1538
		Khushab	13	94	2500	200	700	700	700	200	2500
	D.G. Khan	D.G. Khan	21	50	1000	100	250	250	250	150	1000
		Rajanpur	0	21	500	50	125	125	125	75	500
		TOTAL	1500	1588	16538	1650	4325	4325	4325	1913	16538

Year Wise and District wise Physical Targets for Allocation of Area Under Fruits Plants, Oil Seeds, Pulses and Fodder Crops

Establishment of Fodder Crops											
Sr. No.	Name of Division	Name of District	No. of Mini Dams	No. of Ponds.	Area to be Allocated (Acre)	2019-20	2020-21	2021-22	2022-23	2023-24	Total
	Rawalpindi	Rawalpindi	547	378	2000	200	500	500	500	300	2000
		Chakwal	336	422	2000	200	500	500	500	300	2000
		Jehlum	332	420	2000	200	500	500	500	300	2000
		Attock	187	163	1562	150	400	400	400	212	1562
	Gujranwala	Gujrat	27	29	800	100	200	200	200	100	800
	Sargodha	Mianwali	37	11	800	100	200	200	200	100	800
		Khushab	13	94	1300	150	350	350	300	150	1300
	D.G. Khan	D.G. Khan	21	50	800	100	200	200	200	100	800
		Rajanpur	0	21	300	25	85	85	80	25	300
	TOTAL		1500	1588	11562	1225	2935	2935	2880	1587	11562

Year Wise and Component Wise Financial Phasing of the Project

SUMMARY FOR COST ESTIMATES OF THE PROJECT "NATIONAL PROGRAM FOR ENHANCING COMMAND AREA OF SMALL AND MINI DAMS IN BARANI AREAS OF PAKISTAN (EXTENSION COMPONENT)

Object Codes	Item	Year	Year	Year	Year	Year	Total
		2019-20	2020-21	2021-22	2022-23	2023-24	
Subsidy Component							
A03942	Subsidy for Establishment of Fruits Plants	15.63	38.78	39.25	39.25	17.11	150.00
A03942	Subsidy for Establishment of Oil Seed/Pulses	28.05	73.525	73.525	73.525	32.521	281.15
A03942	Subsidy for Establishment of Fodder Crops	20.83	49.90	49.90	48.96	26.98	196.55
Subsidy Total		64.50	162.20	162.67	161.73	76.61	627.70
Operational Cost							
A09	Physical Assets (Computer, Furniture, etc)	0.00	1.00	0.00	0.00	0.00	1.00
A03901	Stationery	0.30	0.30	0.30	0.30	0.30	1.50
A03902	Printing of Literature	0.10	0.50	0.50	0.50	0.50	2.10
A03907	Publicity through Electronic and Print Media	0.00	1.00	1.00	1.00	1.00	4.00
A03805	Travelling Allowance	2.00	3.50	3.50	3.50	3.50	16.00
A03807	POL	2.50	3.50	3.50	3.50	3.50	16.50
A13001	R&M of Transport	0.30	1.00	1.00	1.00	1.00	4.30
Operational Cost Total		5.20	10.80	9.80	9.80	9.80	45.40
G. Total		69.70	173.00	172.47	171.53	86.41	673.10

Demand and Supply Analysis N.A.

Financial plan and mode of financing

Sponsoring own resources:

Debt: N.A.

Grants: N.A.

Weighted cost of capital: N.A.

Project benefits and analysis

<input type="checkbox"/>	Social benefits with indicators	<p>Fruits on economical rates will play vital role in provision of source of nutrition to the rural masses.</p> <p>Skill and awareness of community regarding orchards, and edible oil will improve.</p> <p>Fodder will improve the quality of livestock.</p> <p>Health and living standards of the masses will improve.</p> <p>Area and Production of Oil Seed Crop will increase resulting in reduced exchequer on import of edible oils</p>
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<input type="checkbox"/>	Employment generation: As a consequence of expansion in labor intensive (direct and indirect) enterprise and value addition activities, new employment opportunities would be created for rural masses.						
<input type="checkbox"/>	Environmental impact The project activities are in line with natural resource conservation. Enhanced vegetative cover and plantation will improve the environment and decrease environmental pollution. The project is environmental friendly and has very positive impact.						
<input type="checkbox"/>	Quantifiable output of the Project: <table border="1" data-bbox="305 1255 1479 1932"> <tr> <td data-bbox="305 1255 565 1932"></td> <td data-bbox="565 1255 672 1932"></td> <td data-bbox="672 1255 857 1932"></td> <td data-bbox="857 1255 1479 1932"> <p>With the implementation of project, the production of fruits, fodder and edible oil will be enhanced qualitatively and quantitatively for domestic use. As project is labor intensive, so reasonable employment will also be available in the masses. The awareness level of different cultural practices and their adoption will be increased, so following will be the quantifiable outcomes of the project:-</p> <p>The awareness level of community regarding different agronomic practices will be enhanced up to 90%.</p> <p>The production of quality fruits will be increased at 5-7% p.a.</p> </td> </tr> </table>						<p>With the implementation of project, the production of fruits, fodder and edible oil will be enhanced qualitatively and quantitatively for domestic use. As project is labor intensive, so reasonable employment will also be available in the masses. The awareness level of different cultural practices and their adoption will be increased, so following will be the quantifiable outcomes of the project:-</p> <p>The awareness level of community regarding different agronomic practices will be enhanced up to 90%.</p> <p>The production of quality fruits will be increased at 5-7% p.a.</p>
			<p>With the implementation of project, the production of fruits, fodder and edible oil will be enhanced qualitatively and quantitatively for domestic use. As project is labor intensive, so reasonable employment will also be available in the masses. The awareness level of different cultural practices and their adoption will be increased, so following will be the quantifiable outcomes of the project:-</p> <p>The awareness level of community regarding different agronomic practices will be enhanced up to 90%.</p> <p>The production of quality fruits will be increased at 5-7% p.a.</p>				

				Availability of fodder will be increased up to 5%. Availability of quality edible oil in the area will enhance up to 5%.
17.	Impact	of	delays on	Delay in providing subsidy and release of funds
	project cost and viability may result in failure of the project.			
18.	Implementation schedule			
	Indicate Starting & Completion date			01-07-2019 to 30-06-2024 (60 months)
	Item wise/Year wise implementation schedule in the line chart correlated with the physical Activities			Attached as annexure
19	Management structure and manpower requirements			Progressive farmers, having experience under the guidance of Extension staff of Agriculture Department already available with the Agriculture Department (Ext. Wing) of Rawalpindi Division.

**National Program for Enhancing Command Area of Small and Mini Dams
in Barani Areas of Pakistan (The Punjab Component)**

Year-wise Phasing of Physical Targets

Sr. No.	Particulars	Unit	2019-20	2020-21	2021-22	2022-23	2023-24	Total
I Water Management Component								
A.	Farm Pond	Nos.	30	40	100	160	150	480
B.	Solar Pumping System for Farm Ponds	Nos.	30	40	100	160	150	480
C.	Dugwell Development	Nos.	50	125	175	200	186	736
D.	Solar Pumping System on Dugwells	Nos.	50	125	175	200	186	736
E.	Watercourse Development	Nos.	50	100	200	150	100	600
F.	LASER Land Leveling Units	Nos.	50	100	150	100	100	500
II Extension Component								
G.	Fruit Plants	Acres	665	1,650	1,670	1,670	728	6,383
H.	Oilseeds/Pulses Crops	Acres	1,650	4,325	4,325	4,325	1,913	16,538
I.	Fodder/Forage/Range	Acres	1,225	2,935	2,935	2,880	1,587	11,562

**National Program for Enhancing Command Area of Small and Mini Dams
in Barani Areas of Pakistan - The Punjab Component
Year-wise Phasing of Financial Outlay**

(Rs. Million)									
Object Code	Sr. No.	Estimated Financial Outlay	Unit Cost	2019-20	2020-21	2021-22	2022-23	2023-24	Total
PC22036 Development									
I Water Management									
A. Farm Pond									
A05120	i)	Government Share (60%)	0.7200	21.600	28.800	72.000	115.200	108.000	345.600
	ii)	Farmers' Contribution (40%)	0.4800	14.400	19.200	48.000	76.800	72.000	230.400
		Sub-Total (A)	1.2000	36.000	48.000	120.000	192.000	180.000	576.000
B. Solar Pumping System for Farm Ponds									
A05120	i)	Government Share (60%)	0.7200	21.600	28.800	72.000	115.200	108.000	345.600
	ii)	Farmers' Contribution (40%)	0.4800	14.400	19.200	48.000	76.800	72.000	230.400
		Sub-Total (B)	1.2000	36.000	48.000	120.000	192.000	180.000	576.000
C. Dugwell Development									
A05120	i)	Government Share (60%)	0.4800	24.000	60.000	84.000	96.000	89.280	353.280
	ii)	Farmers' Contribution (40%)	0.3200	16.000	40.000	56.000	64.000	59.520	235.520
		Sub-Total (C)	0.8000	40.000	100.000	140.000	160.000	148.800	588.800
D. Solar Pumping System on Dugwells									
A05120	i)	Government Share (60%)	0.4800	24.000	60.000	84.000	96.000	89.280	353.280
	ii)	Farmers' Contribution (40%)	0.3200	16.000	40.000	56.000	64.000	59.520	235.520
		Sub-Total (D)	0.8000	40.000	100.000	140.000	160.000	148.800	588.800
E. Watercourse Development									
A05120	i)	Government Share (60%)	0.3000	15.000	30.000	60.000	45.000	30.000	180.000
	ii)	Farmers' Contribution (40%)	0.2000	10.000	20.000	40.000	30.000	20.000	120.000
		Sub-Total (E)	0.5000	25.000	50.000	100.000	75.000	50.000	300.000
F. LASER Land Leveling Units									
A05120	i)	Government Share (50%)	0.2500	12.500	25.000	37.500	25.000	25.000	125.000
	ii)	Farmers' Contribution (50%)	0.2500	12.500	25.000	37.500	25.000	25.000	125.000
		Sub-Total (F)	0.5000	25.000	50.000	75.000	50.000	50.000	250.000
II Extension Component									
G. Fruit Plants									
A03942	i)	Government Share (100%)	0.0235	15.628	38.775	39.245	39.245	17.108	150.001
	ii)	Farmers' Contribution	0.0000	-	-	-	-	-	-
		Sub-Total (G)	0.0235	15.628	38.775	39.245	39.245	17.108	150.001
H. Oilseeds/Pulses Crops									
A03942	i)	Government Share (100%)	0.0170	28.050	73.525	73.525	73.525	32.521	281.146
	ii)	Farmers' Contribution	0.0000	-	-	-	-	-	-
		Sub-Total (H)	0.0170	28.050	73.525	73.525	73.525	32.521	281.146
I. Fodder/Forage/Range									
A03942	i)	Government Share (100%)	0.0170	20.825	49.895	49.895	48.960	26.979	196.554
	ii)	Farmers' Contribution	0.0000	-	-	-	-	-	-
		Sub-Total (I)	0.0170	20.825	49.895	49.895	48.960	26.979	196.554
J. Awareness Creation & Capacity Building									
			-	2.100	5.586	6.678	4.368	2.478	21.210
K. Project Management Cost									
	i)	Project Supervision and Administration Cost	-	5.900	10.100	12.400	12.400	11.200	52.000
	iii)	Operational Cost (Soil Cons. component)	-	3.421	3.788	4.048	4.374	4.370	20.001
	iv)	Operational Cost (Extension component)	-	5.200	10.800	9.800	9.800	9.800	45.400
		Sub-Total (K)	-	14.521	24.688	26.248	26.574	25.370	117.401
L. Physical and Price Contingencies									
			-	-	2.665	5.582	8.577	9.907	26.731
		Total PC22036-Development	-	199.824	427.734	610.673	693.649	563.923	2,495.802
PC12042-Agriculture									
	M.	Office Building/ Project Offices (Lumpsum)	-	-	20.000	20.000	-	-	40.000
		Total PC12042-Development	-	-	20.000	20.000	-	-	40.000
		Total Project Cost		283.124	611.134	916.173	1,030.249	871.963	3,712.642
	(i)	Government Share		199.824	447.734	630.673	693.649	563.923	2,535.802
		Federal		73.281	158.984	231.099	265.083	214.430	942.877
		Punjab		126.543	288.750	399.574	428.566	349.493	1,592.926
	(ii)	Farmers' Contribution		83.300	163.400	285.500	336.600	308.040	1,176.840

**National Program for Enhancing Command Area of Small and Mini Dams in
Barani Areas of Pakistan - The Punjab Component
Operational Cost for Water Management Component**

Object Code	Unit of Appropriation	2019-20	2020-21	2021-22	2022-23	2023-24	Total
A03	Operating Expenses						
A032	Communication						
A03805	Travelling Allowance	1,500,000	2,500,000	3,500,000	3,500,000	3,000,000	14,000,000
A03807	P.O.L. Charges	1,500,000	2,500,000	3,500,000	3,500,000	3,000,000	14,000,000
A03901	Office Stationery	500,000	800,000	800,000	800,000	800,000	3,700,000
A03902	Printing & Publication	500,000	800,000	800,000	800,000	500,000	3,400,000
A03907	Advertising & Publicity Charges	500,000	500,000	300,000	300,000	300,000	1,900,000
A03918	Exhibitions, Fairs & National Celebrations	500,000	1,000,000	1,200,000	1,200,000	800,000	4,700,000
A03970	Other	500,000	1,000,000	1,000,000	1,000,000	1,000,000	4,500,000
	Total Operating Expenses:-	5,500,000	9,100,000	11,100,000	11,100,000	9,400,000	46,200,000
A13	Repair & Maintenance of Durable Goods						-
A13001	Transport	400,000	800,000	1,000,000	1,000,000	1,500,000	4,700,000
A13101	Machinery & Equipment	-	200,000	300,000	300,000	300,000	1,100,000
	Total Repair & Maintenance:-	400,000	1,000,000	1,300,000	1,300,000	1,800,000	5,800,000
	G-TOTAL	5,900,000	10,100,000	12,400,000	12,400,000	11,200,000	52,000,000
		5.900	10.100	12.400	12.400	11.200	52.000

National Program for Enhancing Command Area of Small and Mini Dams in Barani Areas of Pakistan - The Punjab Component

Year-wise Phasing of Physical Targets of Awareness Creation and Capacity Building

Sr. No.	Course Title	Duration (Days)	2019-20		2020-21		2021-22		2022-23		2023-2024		Total	
			Phy.	Parti.	Phy.	Parti.	Phy.	Parti.	Phy.	Parti.	Phy.	Parti.	Phy.	Parti.
1	Training of Laser Tractor Operators	5	1	20	5	100	9	180	4	80	4	80	23	460
2	Awareness Creation Among Farming for Farm Pond and Dugwell Development	1	13	520	26	1,040	20	800	20	800	5	200	84	3,360
Total			14	540	31	1,140	29	980	24	880	9	280	74	2,660

Year-wise Phasing of Financial Implications of Awareness Creation and Capacity Building (Rs.)

Object Code	Particulars	2019-20	2020-21	2021-22	2022-23	2023-24	Total
A038	Travel & Transportation						
A03805	Travelling Allowances	395,000	700,000	900,000	700,000	395,000	3,090,000
A03807	POL Charges	550,000	1,650,000	1,900,000	1,300,000	650,000	6,050,000
A03823	Other Training domestic	200,000	900,000	1,200,000	750,000	300,000	3,350,000
A039	General						
A03901	Office Stationery	50,000	150,000	200,000	100,000	70,000	570,000
A03902	Printing	50,000	150,000	200,000	75,000	90,000	565,000
A03907	Advertisement and Publicity	300,000	650,000	750,000	350,000	100,000	2,150,000
A03918	Exhibition, Fairs & National Celebrations	215,000	400,000	400,000	300,000	200,000	1,515,000
A03942	Cost of Other Stores	50,000	146,000	150,000	95,000	73,000	514,000
A03955	Computer Stationery	40,000	90,000	90,000	98,000	60,000	378,000
A03970	Others	100,000	300,000	300,000	150,000	150,000	1,000,000
A013	Total Repair & Maintenance of Durable Goods						
A013001	Transport	100,000	350,000	450,000	350,000	300,000	1,550,000
A013101	Machinery & Equipment	50,000	100,000	138,000	100,000	90,000	478,000
Total (Rs.)		2,100,000	5,586,000	6,678,000	4,368,000	2,478,000	21,210,000
Total (Rs. Million)		2.100	5.586	6.678	4.368	2.478	21.210

**National Program for Enhancing Command Area of Small and Mini Dams in Barani
Areas of Pakistan (The Punjab Component)
Operational Cost for ABAD/Soil Conservation Component**

OPERATING EXPENSES	2019-20	2020-21	2021-22	2022-23	2023-24	Total
A03 Total operating Expenses	3.421	3.788	4.048	4.374	4.370	20.000
A032 Total Communication	0.075	0.100	0.106	0.106	0.115	0.503
A03201 Postage and Telegraph	0.025	0.038	0.038	0.038	0.040	0.178
A03202 Telephone and Trunk Calls	0.050	0.063	0.069	0.069	0.075	0.325
A033 Total Utilities	0.153	0.143	0.170	0.198	0.253	0.915
A03302 Water	0.003	0.005	0.005	0.005	0.008	0.025
A03303 Electricity	0.100	0.125	0.150	0.175	0.225	0.775
A03304 Hot & Cold	0.050	0.013	0.015	0.018	0.020	0.115
A034 Total Occupancy Cost	0.788	0.920	0.948	1.000	1.075	4.730
A03402 Rent for Office Building	0.750	0.875	0.900	0.950	1.000	4.475
A03407 Rate and Taxes	0.038	0.045	0.048	0.050	0.075	0.255
A038 Total Travel & Transportation	1.570	1.875	2.040	2.185	2.338	10.008
A03805 Travelling Allowance	0.550	0.650	0.710	0.800	0.900	3.610
A03806 Transportation of Goods	0.020	0.025	0.030	0.035	0.038	0.148
A03807 POL Charges.	1.000	1.200	1.300	1.350	1.400	6.250
A039 Total General	0.411	0.300	0.409	0.510	0.340	1.970
A03901 Stationery	0.045	0.050	0.048	0.063	0.028	0.233
A03902 Printing and Publication	0.045	0.048	0.003	0.050	0.030	0.175
A03905 Newspapers, Periodicals and Books	0.003	0.010	0.005	0.015	0.003	0.035
A03907 Advertisement and Publicity 2%	0.008	0.010	0.005	0.013	0.005	0.040
A03942 Cost of Other Stores	0.286	0.145	0.300	0.325	0.250	1.306
A03970 Others	0.025	0.038	0.049	0.045	0.025	0.182
A13 Total Repair & Maintenance	0.425	0.450	0.375	0.375	0.250	1.875
A13001 Transport	0.425	0.450	0.375	0.375	0.250	1.875

National Program for Enhancing Command Area of Small and Mini Dams in Barani Areas of Pakistan (The Punjab Component)

Procedure for Watercourse improvement



9/8/03

No.1-1140-Agri-(FD)/11-P-VIII
GOVERNMENT OF THE PUNJAB
FINANCE DEPARTMENT
Dated Lahore, the 12.09.2017

251

To,

The Secretary
Government of the Punjab,
Agriculture Department.

Diary No. 2-1945
Date 14/9
Agriculture Dept.
Civil Secretariate
Lahore

Subject:- PROCEDURE FOR IMPROVEMENT OF WATERCOURSES IN THE PUNJAB

I am directed to refer to this department's letter No. 1/933-Agri-I-(FD)/03 dated 28.05.2004 on the subject cited above and to state that with the establishment of new local governments under Punjab Local Government Act, 2013, the erstwhile Local Governments stand abolished. In terms of the provisions contained in the Punjab Local Government Ordinance, 2001 (as amended from time to time) the various provincial departments were devolved to the erstwhile District Governments. However, on the abolition of the District Governments the function performed by the erstwhile district governments have been reassigned to the successor local government or the provincial government, as defined in the PLGA, 2013. The functions of Primary & Secondary Healthcare and Primary & Secondary Education prior to 2001 was a concurrent function of the Provincial Government as well as local councils, have now been assigned to the respective District Authorities and in terms of section 3 of PLGA, 2013, rest of the departments working under District Governments including On Farm Water Management wing of the Agriculture Department, have been assigned to the Provincial Government.

15819
18917

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I am further to state that on reversion of the devolved component of the Agriculture Department will function as a wing of a department of Provincial setup and the set of financial rules and policies as applicable to other wings will also be applicable to OFWM wing. The requisite funds for salary as well as pertaining to ADP 2016-17 etc were provided during previous financial year besides allotting new DDO codes (cost centers), where required, for execution of development schemes provided those offices are acting as executing agencies.

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SSA	
AS (P)	✓
AS (I)	
Chief P&EC	
PO	
PS	

3. Meanwhile, I have been directed to advise as under;
i) The Director (OFWM) / Deputy Directors Agriculture (OFWM) may accord technical sanction of the approved ADP schemes provided that the 50% contribution on account of labour charges (mason & labour) have been deposited in the joint bank accounts of the Water User Association and the requisite earth work of the watercourses at prescribed standard have been completed.

PA. to A.S. Admn
Diary 5188
D.D. 16-09-17

SOCP

- ii) The concerned officer, if required to procure the material for execution of the scheme, shall follow the provisions of PPRA rules / donor's procurement guidelines.
- iii) On completion of formalities, as above, the Deputy Director (OFWM) will arrange the shifting of funds into the bank account of the Water User Association, in three instalments to the extent of government share, as released against ADP scheme(s), in prescribed manner.
- iv) In case procurement is carried out by the User Associations, the procurement will be made as per approved SOP for the Water User Associations acceptable to the donor in case of donor funding.
- v) The Water User Associations shall maintain the vouched account of all transactions carried out by the Association through its bank account for execution of the scheme and will be responsible to the Deputy Director (OFWM) or by the nominated officer for its verification, from and its Audit.
- vi) The bank accounts maintained by the Water User Associations for the period of the erstwhile District Governments shall be closed and closing audit should be carried out. The balance, if any, shall be reverted to the concerned payee. In case execution of the ADP scheme for improvement of water courses is to be carried out in the provincial setup with the same area where previously scheme remained un complete, fresh bank account may be opened, to be jointly operated by the Chairman and Treasures of the Association and the association will be required to submit quarterly bank statement to the Deputy Director (OFWM), alongwith the specimen signature of the operators of the account.
4. I am accordingly requested that the above guidelines may be brought to the notice of all concerned officers of the Water Management wing of your department for guidance and strict compliance.

/

(HASEEB ASLAM KHAN)
SECTION OFFICER (F&C/AGRI.)

No. & Date Even

- A copy is forwarded for information to;
- i) The Accountant General Punjab, Lahore.
- ii) All District Accounts Officers in Punjab.
- iii) The Treasury Officer, Lahore.
- iv) The Director General Agriculture (Water Management) Punjab, Lahore, 21-Davis Road, Lahore.

/

SECTION OFFICER (F&C/AGRI.)

No. & Date Even

- A copy is forwarded for information to;
- i) The Chief Inspector of Treasury & Accounts Punjab, Lahore.
- ii) PS to PS for information of the Finance Secretary.
- iii) PS to SSF (E&CF) for information of the SSF.

Haseeb Aslam Khan

SECTION OFFICER (F&C/AGRI.)

**National Program for Enhancing Command Area of Small and Mini Dams in Barani
Areas of Pakistan (The Punjab Component)**

Economic Analysis of Water Management Activities

(PKR million)

Year	Capital Cost	O&M	Total Costs	Net Benefits due to Intervention						Total Benefits	Net Benefits
				Farm Pond	Dugwell	Solar for Farm Pond	Solar for Dugwell	Watercourse	LASER Land Leveler		
a	b	c	d = b+c	e	f	g	h	i	j	K = e+ f+g+h+i+j	l = k - d
1	254.9	-	254.9	-	-	-	-	-	-	-	(254.9)
2	549.8	22.9	572.8	22.8	18.0	4.5	3.8	3.6	68.8	121.4	(451.4)
3	824.6	72.4	897.0	53.2	63.0	10.5	13.1	10.7	206.3	356.8	(540.2)
4	927.3	146.6	1,074.0	129.2	126.0	25.5	26.3	25.0	412.5	744.5	(329.5)
5	784.8	230.1	1,014.9	250.8	198.0	49.5	41.3	35.8	550.0	1,125.3	110.5
6	-	300.7	300.7	364.8	265.0	72.0	55.2	42.9	687.5	1,487.4	1,186.7
7	-	300.7	300.7	364.8	265.0	72.0	55.2	42.9	687.5	1,487.4	1,186.7
8	-	300.7	300.7	364.8	265.0	72.0	55.2	42.9	687.5	1,487.4	1,186.7
9	-	300.7	300.7	364.8	265.0	72.0	55.2	42.9	687.5	1,487.4	1,186.7
10	-	300.7	300.7	364.8	265.0	72.0	55.2	42.9	687.5	1,487.4	1,186.7
11	-	300.7	300.7	364.8	265.0	72.0	55.2	42.9	687.5	1,487.4	1,186.7
12	-	300.7	300.7	364.8	265.0	72.0	55.2	42.9	618.8	1,418.6	1,117.9
13	-	300.7	300.7	364.8	265.0	72.0	55.2	42.9	481.3	1,281.1	980.4
14	-	300.7	300.7	364.8	265.0	72.0	55.2	42.9	275.0	1,074.9	774.2
15	-	300.7	300.7	364.8	265.0	72.0	55.2	42.9	137.5	937.4	636.7
16	-	300.7	300.7	364.8	265.0	72.0	55.2	42.9	-	799.9	499.2
17	-	300.7	300.7	364.8	265.0	72.0	55.2	42.9	-	799.9	499.2
18	-	300.7	300.7	364.8	265.0	67.5	51.5	42.9	-	791.6	490.9
19	-	300.7	300.7	364.8	265.0	61.5	42.1	42.9	-	776.3	475.5
20	-	300.7	300.7	364.8	265.0	46.5	29.0	42.9	-	748.1	447.4
21	-	300.7	300.7	364.8	265.0	22.5	14.0	42.9	-	709.1	408.4
22	-	277.8	277.8	342.0	247.0	-	-	39.4	-	628.3	350.5
23	-	228.3	228.3	311.6	202.0	-	-	32.2	-	545.8	317.5
24	-	154.1	154.1	235.6	139.0	-	-	17.9	-	392.4	238.4
25	-	70.6	70.6	114.0	67.0	-	-	7.2	-	188.1	117.5
26	-	-	-	-	-	-	-	-	-	-	-
NPV of Cost		3,825.2									
NPV of Benefit		6,693.7									
B/C ratio		1.75									
EIRR		34.50%									

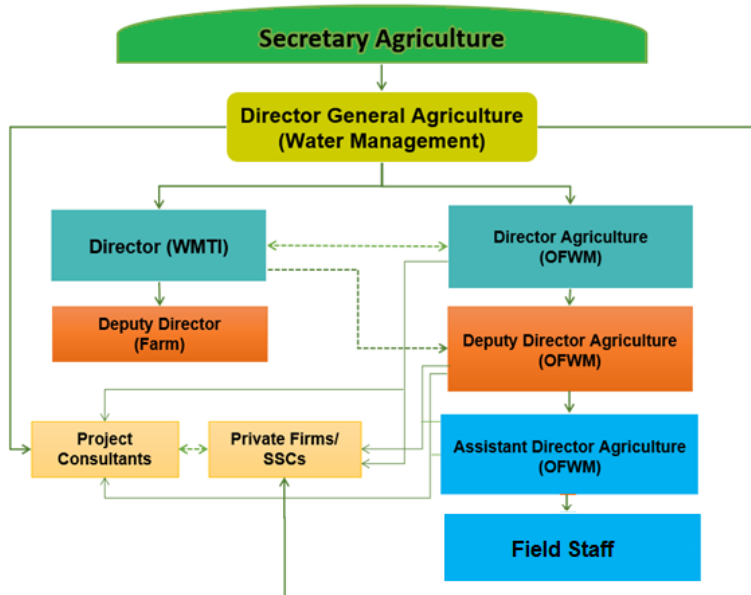
National Program for Enhancing Command Area of Small and Mini Dams in Barani Areas of Pakistan (The Punjab Component)

Tentative Timeline for Proposed Activities

Sr. No.	Activity/ Component	Target (Nos.)	2019-20				2020-21				2021-22				2022-23				2023-24			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
I	Water Management Component																					
1	Construction of Farm Ponds	480				30				70				170				330				480
2	Solar Pumping System for Farm Pond	480				30				70				170				330				480
3	Dugwell Development	736				50				175				350				550				736
4	Solar Pumping System for Dugwell	736				50				175				350				550				736
5	Watercourse Development/ Improvement	600				50				150				350				500				600
6	LASER Land Leveling Unit	500				50				150				300				400				500
II	Extension Component	Acres																				
7	Fruit Plants	6,383				665				2,315				3,985				5,655				6,383
8	Oilseeds/Pulses Crops	16,538				1,650				5,975				10,300				14,625				16,538
9	Fodder/Forage/Range	11,562				1,225				4,160				7,095				9,975				11,562

National Program for Enhancing Command Area of Small and Mini Dams in Barani Areas of Pakistan (The Punjab Component)

Proposed Institutional Arrangements





Off # 042-99059302


NO.12(9) PO(COORD-II)P&D/2019
GOVERNMENT OF THE PUNJAB
PLANNING & DEVELOPMENT BOARD
Dated Lahore the 11th April, 2019

1. The Secretary to Government of the Punjab:
 - i. Finance Department.
 - ii. Agriculture Department.
 - iii. Environment Protection Department.
2. The Chief Economist / Joint Chief Economist / All Members, P&D Board.
3. The Director, Punjab Economic Research Institute (PERI)
4. The Director General, Monitoring & Evaluation (M&E)

Subject: **MINUTES / DECISIONS OF THE MEETING OF PROVINCIAL DEVELOPMENT WORKING PARTY (PDWP). (SECTOR: AGRICULTURE)**

I am directed to enclose herewith a copy of minutes of the **22nd PDWP meeting held on 3rd April, 2019** under the chairmanship of Chairman P&D Board, for information and further necessary action of the following schemes:-

Agenda Item No.	Name of the scheme	Gestation period	Decision
6	National Program for Enhancing Command Area of Small and Mini Dams in Barani Areas of Pakistan.	2019-20	Cleared
7	National Program for Improvement of Watercourses in Pakistan.	to 2023-24	Cleared


(MUHAMMAD RASHID)
PLANNING OFFICER (COORD-II)

A Copy, along with copy of the minutes, is forwarded to the :-

Sr.No.	PARTICULARS
	PLANNING & DEVELOPMENT BOARD, LAHORE
1	Chiefs: Agriculture, ECA, Technical and Monitoring
2	Manager (MIS) to update status of the schemes on the SMDP portal
3	PSO to Chairman, P&D Board
4	PS to Secretary, P&D Board
	C.C.
5	Chief (Agriculture) Planning Dev. & Reform Division, Govt. of Pakistan, "P" Block, Pak Secretariat, Islamabad.
6	Deputy Secretary (Staff Officer) to Chief Secretary, Punjab


PLANNING OFFICER (COORD-II)

GOVERNMENT OF THE PUNJAB
PLANNING & DEVELOPMENT BOARD
(Agriculture Section)

MINUTES OF 22nd PDWP MEETING HELD ON APRIL 3rd, 2019 UNDER THE
CHAIRMANSHIP OF CHAIRMAN, P&D BOARD

List of participants is attached

**Agenda item # 6: NATIONAL PROGRAM FOR ENHANCING COMMAND AREA OF
SMALL AND MINI DAMS IN BARANI AREAS OF PAKISTAN-THE
PUNJAB COMPONENT (COST RS. 3769.912 MILLION)**

The Chief (Agriculture) apprised the house that under Prime Minister's Agricultural Package, the instant project is designed for rain fed areas of Punjab Province with the aim to enhance crop productivity and to promote cultivation of high value crops through developing land and water resources using modern irrigation techniques. The specific scope of the project is to construct 480 farm ponds for storing rain water from various sources, installation of 480 solar pumping system on farm ponds for operation of high efficiency irrigation system, improvement of 600 watercourses, provision of 500 Laser land levelers to the farmers and provision of fruit plants, oil seed/pulses crops and fodder/forage/range on 6383, 16538 and 11562 acres respectively. The combined effect of these interventions would contribute significantly in increasing farm income, improving livelihood of people and alleviation of poverty in a sustainable manner.

2. He further apprised that except provision of fruit plants, oilseeds/pulses crops and fodder/forage to the farmers which is at 100% subsidized rates, all other interventions are at 60:40 cost sharing basis. He further highlighted the observations of P&D Board for the decision of PDWP. Chief Agriculture further briefed the house initially the task of command area development was with ABAD, but now the Water Management of Agriculture Department will execute the same task.

3. Secretary P&D Board in response to the query of Member (Energy) opined that financial assistance from Federal Government especially to devolved subject of province should always be welcomed. He further added that Agriculture department to make all possible efforts to make this project a success story. Secretary P&D proposed to include data of total command area, already developed and balance area to be developed in the PC-I.

4. On the query of the Chair regarding need and capacity of the Agriculture Department to run the project, Secretary Agriculture Department assured that they have the expertise to execute such projects successfully in the province. Moreover, project is aligned with the Punjab Agriculture Policy and such interventions would enhance the production and productivity in Barani areas.

5. Member (PSW), apprised the house that the Production Sector Wing has the competency to evaluate the project objectives and it is observed that the interventions

under the instant project would not achieve the results in terms of improving GDP and GNP. Responding to the query of Member Energy P&D Board, Secretary Agriculture informed that the study for contribution of proposed interventions to GDP has not so far been conducted. However, in future, such study can be conducted.

6. Member (PSW) further highlighted the observations of Agriculture Section especially high cost of supervision, administration and awareness creation and contingencies etc and accordingly proposed to delete these costs or rationalize to bare minimum level.

7. Member PPP highlighted that economic analysis of the project have been carried out which reveals that the project is economically viable / feasible but the assumptions of the economic analysis have not been provided in the PC-I. He further added that it is very surprising that the cost of construction of farm ponds (Rs. 576.00 million) is exactly the same to cost of installation of solar pumping system (Rs. 576.00 million). Similarly, the cost of dug wells development is Rs. 588.00 million which is same to that of installation of solar system on dug wells. Secretary Agriculture responded that economic analysis is based on certain assumptions which will be discussed with concerned Section of P&D and it would also be made part t of final PC-I. Responding to the query of Member (PPP) regarding similar costs of components, Director General (WM), informed that all the costs have been calculated very carefully and it is by chance these are matching.

8. The Chair observed that the cost of solar system under the instant project is on higher side which needs to be rationalized. Secretary Agriculture assured that costing is obviously made on the basis of market rates of February 2019 however; cost calculation will be revisited before submission of final PC-I to P&DB. The chair also directed that all other costs like operational cost, incentives for the field staff etc may be rationalized.

Decision:

PDWP cleared the project with gestation period from 2019-20 to 2023-24 to be placed before CDWP for consideration/approval subject to following recommendations:

- i. The costs of solar pumping farm ponds and dug wells may be revisited and it may be rationalized.
- ii. Economic analysis of the project will be got cleared from Economic Analyst of P&D Board before submission of final PC-I.
- iii. The cost of non-core components (supervision, administration, contingencies, procurement of vehicles etc) may be rationalized.
- iv. Command area development of Mini Dams is the function of ABAD, it may be consulted and specified role may be given to ABAD and the same may be made part of final PC-I.
- v. After doing needful, Administrative Department may submit amended PC-I for the signatures of Chairman P&D Board.

LIST OF PARTICIPANTS

P&D DEPARTMENT

1. Mr. Habib-ur-Rehman Gilani,
Chairman, P&D Board
2. Mr. Iftikhar Ali Sahoo,
Secretary
3. Dr. Muhammad Abid Bodla,
Member(ID)
4. Mr. Amir Khattak,
Member (PSW)
5. Agha Waqar Javed,
Member (PPP)
6. Mr. Sohail Saqlain,
Member (Health, Nutrition & Population)
7. Mr. Sadaqat Hussain,
Member (Energy/IT)
8. Mr. Khalid Sultan,
Member (Education)
9. Dr. Ayesha Saeed,
Member (PSD)
10. Mr. Javid Latif
Senior Chief (Coordination)
11. Dr. Muhammad Ashraf,
Chief (Agriculture)
12. Dr. Muhammad Arif Raza
Assistant Chief (Agriculture)
13. Malik Mehboob Elahi Khar
Chief (Technical)
14. Mr. Ali Nazir Ch.,
Assistant Chief (Coord-II)
15. Muhammad Rashid,
Planning Officer (Coord-II)
16. Muhammad Ahmad Awan
Research Associate (Agri./Food)

In chair

FINANCE DEPARTMENT

17. Ms. Aisha Ghumman,
Deputy Secretary (Infrastructure)

DIRECTORATE GENERAL (M&E)

18. M. Asad Khan
Director Coordination

PUNJAB ECONOMIC RESEARCH INSTITUTE (PERI)

19. Muhammad Awais Tahir
Chief of Research

AGRICULTURE DEPARTMENT

20. Dr. Wasif Khurshid,
Secretary
21. Malik Muhammad Akram
DGA (WM)
22. Mr. Tahir Mehmood
ADA (WM)
23. Mr. Zahid Hussain
Administrative Department (Tech) OFWM
24. Dr. Muhammad Ahmad Bilal
Deputy Secretary (Tech)

ENVIRONMENT PROTECTION DEPARTMENT

25. Mr. Muhammad Javaid
DS (T)