PUNJAB RESILIENT AND INCLUSIVE AGRICULTURE TRANSFORMATION PROJECT (PRIAT)

INSTALLATION OF HIGH EFFICIENCY IRRIGATION SYSTEMS (HEISs)

ADDITIONAL INFORMATION PREQUALIFICATION DOCUMENT (PQD)

DIRECTORATE GENERAL AGRICULTURE (WATER MANAGEMENT) PUNJAB LAHORE

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INSTALLATION OF HIGH EFFICIENCY IRRIGATION SYSTEMS (HEISs)

1. PROJECT BRIEF

The World Bank assisted "Punjab Resilient and Inclusive Agriculture Transformation (PRIAT)" project was approved by the Executive Committee of the National Economic Council (ECNEC) on 07.10.2022 at a total cost of Rs.68,672.560 million for its implementation during five years (2022-23 to 2026-27) in the entire Punjab. The World Bank IDA financing is US$ 200 million/ SDR 148.8 million, whereas the Punjab Government counterpart share is Rs. 9,072.000 million, and farmers' contribution is Rs. 13,737.00 million.

2. OBJECTIVES

The Project Development Objective (PDO) of the project is "to enhance equitable access to, and productivity of, agricultural water, and improve incomes of farmers supported by the project".

i) Upgrade on-farm community irrigation conveyance network in canal and non-canal command areas to improve equitable access of water between head & tail-end farmers and improve water conveyance efficiency.

ii) Transform climate smart agriculture production systems through reformatory water management practices, renewable energy, regenerative agriculture, and high value agriculture technologies.

iii) Improve agriculture value chain through crop diversification, harvesting & value addition, and market integration.

iv) Strengthen private sector service delivery capacity for promotion of climate resilient high value profitable agriculture.

v) Develop capacity of stakeholders to adopt climate smart and high value agricultural practices for enhancing profitability and building resilience.

vi) Generate employment opportunities and green jobs to improve living standards and alleviate poverty in rural areas of the province

3. KEY COMPONENTS

i) Improvement of **1,000** unimproved watercourses

ii) Extension of lining on **2,000** partially improved watercourses.

iii) Reconstruction and extension of lining on **1,000** outlived watercourses

iv) Development of **3,000** irrigation schemes outside canal commands areas

v) Improving community water management (pilot test of water accounting & budgeting)

vi) Promotion of regenerative agriculture, crop diversification, harvesting, processing, agriculture value addition, and inclusive access to markets

vii) **Installation of high efficiency irrigation systems (HEIS) on 40,000 acres**

viii) **Installation of solar system for operating HEIS on 20,000 acres**

ix) Provision of certified orchard plants and vegetable seeds/ seedlings on **5,000** acres

x) Development of **1,000** on-farm water storage/ rainwater harvesting ponds

4. PROJECT LOCATION

Entire Punjab

5. GESTATION PERIOD

Five years (2022-23 to 2026-27)

6. INSTALLATION OF HIGH EFFICIENCY IRRIGATION SYSTEMS (HEISs)

The modernization of farm operations has taken place in every agricultural operation all over the World, and Pakistan can remain no exception. The farmers are using traditional irrigation practices for so many years due to non-availability of modern irrigation technologies, lack of knowledge, and necessary services. Drip, bubbler, sprinkler, impact sprinkler, portable/semi-portable sprinklers, rain-gun, centre pivot etc. are together called as high efficiency irrigation systems (HEISs) are reformatory technologies introduced in Punjab at farmers' fields to bring a paradigm shift in crop production. In drip or trickle irrigation, water is provided directly to individual plants by means of small emitters in the form of droplets. Similarly, bubbler irrigation is very similar to trickle irrigation except that the water is delivered to the plants through a bubbler mounted on small spikes. In rain-gun irrigation systems, water is pumped at high pressure through a piped system and sprayed over the entire cultivated field.

6.1 Drip Irrigation System

Among all high efficiency irrigation systems, drip irrigation (also called as trickle/micro irrigation) is the most efficient technology that makes highly effective use of water, fertilizers, and nutrients. Its main principle is to apply water and other inputs

slowly, regularly, and frequently as close to the plant roots as possible according to plants requirement through emitters installed on plastic pipes laid out in the field. Regular and timely availability of nutrients throughout the plant growth period as per exact requirements and maintenance of favourable soil moisture conditions to maximize crop productivity. It enables right air, water, and nutrients mix in the plant root zone. Drip irrigation technology is best suited for orchards and high value row crops such as cotton, maize, sugarcane, vegetables, etc. It has become the most valued innovation, which optimizes use of water and fertilizers by enhancing irrigation efficiency as much as 95% as compared to other irrigation methods.

6.2 Sprinkler Irrigation System

The sprinkler system is the overhead irrigation whereby water is sprayed on the soil/crop somewhat like rain. A typical sprinkling unit comprises of an electric or diesel pumping unit, a portable or buried main pipeline with hydrants at predetermined intervals, and one or more sprinkler units attached to hydrants or hoses. Sprinkler systems are classified into various types on the basis of their spray pattern and mobility/portability.

6.3 Implementation Procedure for Installation of HEIS

Installation of HEISs would be carried out through supply and service companies (SSCs) pre-qualified by the Agriculture Department. The sequence of implementation activities for the installation of HEIS is given as under:

i. The district/ tehsil OFWM staff and SSCs will mobilize the farmers for adoption of HEISs. Interested farmers may submit application for the installation of high efficiency irrigation systems on his/her land during any time of the year to the ADA (OFWM)/ DDA (OFWM))/ DA (OFWM);
ii. The applications will be scrutinized against approved criteria and eligible applicants will be advised to approach the pre-qualified SSC of their own choice for survey, design, and cost estimation of the selected system. In case of more demand than the district quota/target, balloting process will be conducted at the district level by involving DA (OFWM) and representative of DGA(WM)Punjab, Lahore/ PMU-PRIAT;
iii. The selected SSC will survey the site, prepare design and bill of quantity (BOQ), and submit the same to the DDA (OFWM) who will forward the same to the PIS&TPV Consultants' Field Engineer for review and approval. The farmer, after approval of design and cost estimates, will be advised by the concerned DDA (OFWM) to deposit his/her entire share in the form of pay order/bank draft drawn in favour of selected SSC or evidence of in kind

contribution by the farmer, which will be transmitted to DGA(WM) Punjab, Lahore/ PD PMU-PRIAT for issuance of work order;

iv. Farmer may be given option to contribute “In Kind Material” towards his share (up to maximum of 40%) by providing material as per approved standards and specification. In this case, farmer will purchase new material according to standards and specifications and will get the same verified by Field Engineer of PIS&TPV Consultants. On certification by the Consultants that “in kind” material delivered at site meets the project standards and specifications; and, deposition of remaining farmer’s share, if required, the work order shall be issued on request from DDA(OFWM)/DA(OFWM);

v. After receipt of in-kind/ cash farmer share, DGA(WM) Punjab, Lahore/ PD-PRIAT will issue the work order and advise the concerned SSC to supply the HEIS equipment/material at site within prescribed time limit, which will be verified by the PIS&TPV Consultants for quality and quantity vis-à-vis approved standards/specifications;

vi. On receipt of satisfactory report from the PIS&TPV Consultants received through DDA(OFWM)/ DA(OFWM), DGA(WM) Punjab, Lahore/ PD PMU-PRIAT will make 50% payment of total cost to SSC alongwith advice to install the system. In case 100% material is not shifted at site, the PIS&TPV Consultants will recommend 50% of the verified cost of material, provided that the verified material cost is not less than 80% of total material cost. After material verification, the concerned SSC shall complete the system installation at site within timeframe specified in the work order. In case of delay in installation, late delivery charge will be imposed on SSCs. However, in case of any delay in completion of HEIS commissioning within the specified time due to unavoidable circumstances. The PD-PRIAT/ DGA(WM) Punjab, Lahore may extend the completion period as per proposed recommendations of the farmer/ SSCs/ DDA(OFWM);

vii. On completion of installation, the SSC will report to concerned DDA (OFWM) and PIS&TPV Consultants for commissioning verification of installed system. The Field Engineer PIS&TPV Consultants will verify HEIS installation as per design & cost estimates, while concerned farmer will provide his satisfaction. The PIS&TPV Consultants shall ensure that irrigation & fertigation schedules, log book and O&M manual in local language/Urdu have been provided to farmer; and, training regarding system operation and maintenance imparted to the farmer/ operator in coordination with concerned DDA (OFWM) by the SSC;

viii. The SSCs will provide follow-up support service as per provisions of the agreements;

ix. DGA (WM) Punjab, Lahore/ PD-PRIAT will pay remaining cost after retaining 10% of total system cost or Bank guarantee of equal amount, which will be released after two years on provision of satisfactory follow up support services by the SSCs during two years, which will be verified by the concerned DDA (OFWM) and the PIS&TPV Consultants or any other designated committee for the purpose;

x. All HEIS works will be executed under a tripartite agreement signed by Department, SSC, and the participating farmer;

xi. The SSC/ district/ tehsil OFWM staff will provide technical support to the farmers for the operation, maintenance, and troubleshooting of installed system as well as provide agronomic support regarding cropping geometry, fertigation, weed management, disease/pest control etc. under high efficiency irrigation environment.

xii. In case of any dispute, the matter will be referred to the following Dispute Resolution Committee (DRC) whose decision will be final and would be binding on all stakeholders and not challengeable in any court of law.

    a. Director Agriculture (OFWM), concerned
    b. Deputy Director Agriculture (OFWM), concerned
    c. Field Engineer PIS&TPV Consultants
    d. Representative of SSCs

xiii. After two years of backup support services from SSCs, the beneficiary farmer is solely responsible for operation & maintenance, theft of parts, natural calamity etc. of HEIS site.

xiv. If deemed necessary, the PSC may make necessary modifications in implementation arrangements of this component for smooth execution.

The flow chart of planned activities for installation of HEIS showing role of project implementing entities is shown in Figure 1.

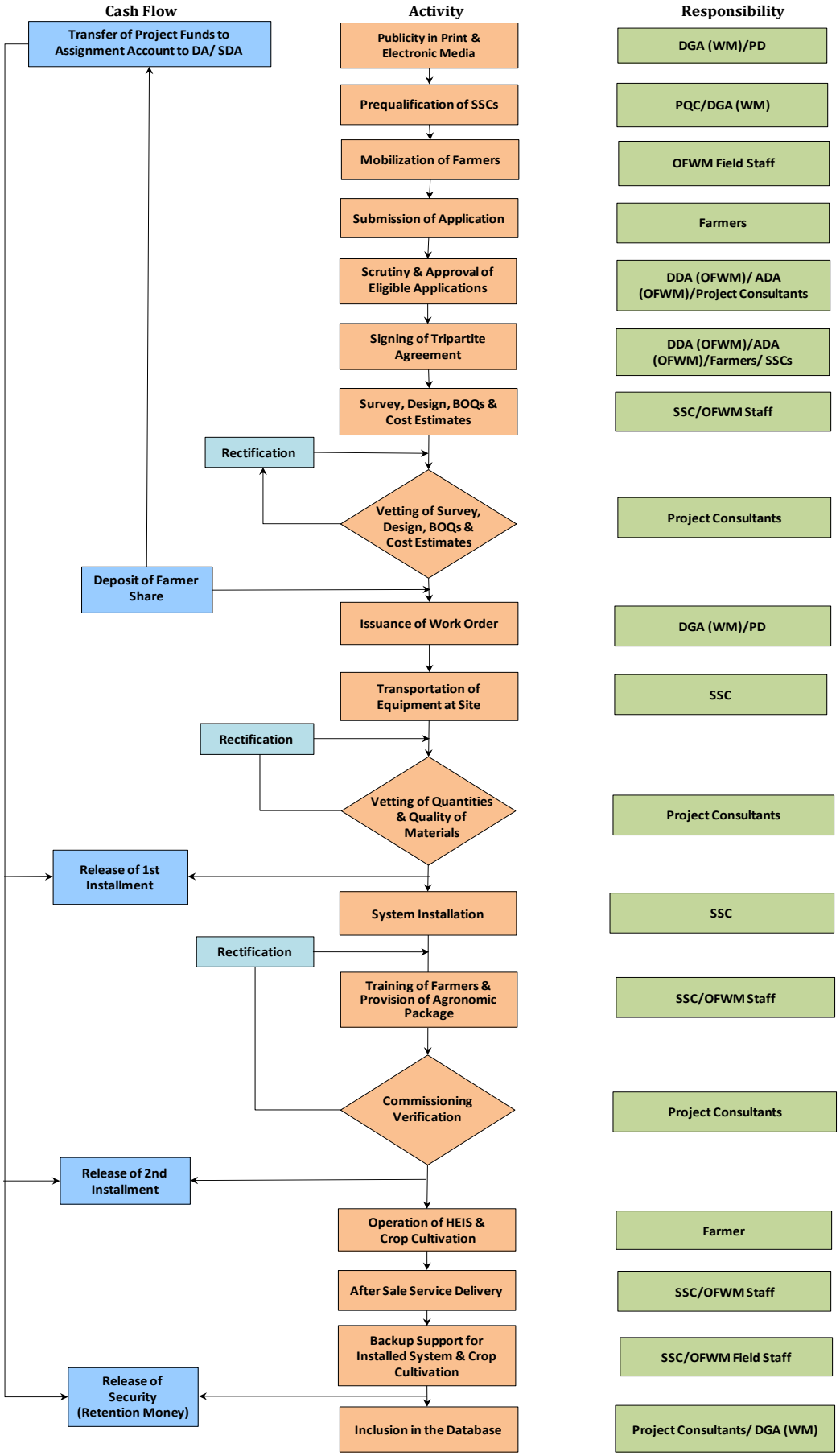

Figure 1. Implementation process for installation of HEISs

6.4 Scope of Work for HEISs

The project envisages installation of drip and sprinkler irrigation systems on **40,000 acres** (about 4,000 sites) at farmers' fields all over the Punjab.

6.5 Cost Sharing

The following sliding scale cost-sharing formula will be implemented for installation of HEISs.

Acreage Slab	Govt. Share/ Subsidy	Farmers' Contribution
Upto 7.5 acres	75%	25%
7.6 to 12.5 acres	60%	40%

6.6 Standards and Specifications of HEISs

a. ANSI/ASAE Standards

ANSI/ASAE S330.1 February 2003	Procedure for Sprinkler Distribution Testing for Research Purposes
ANSI/ASAE S376.2 February 2003	Design, installation and Performance of Underground, Thermoplastic Irrigation Pipelines
ANSI/ASAE S395 February 2003	Safety for Self-Propelled, Hose-Drag Agricultural Irrigation Systems
ANSI/ASAE S397.2 February 2003	Electrical Service and Equipment for Irrigation
ANSI/ASAE S436.1 December 2001	Test Procedure for Determining the Uniformity of Water Distribution of Center Pivot and Lateral Move Irrigation Machines Equipped with Spray or Sprinkler Nozzles
ANSI/ASAE S539 February 2003	Media Filters for Irrigation – Testing and Performance Reporting
ANSI/ASAE S553 March 2001	Collapsible Emitting Hose (Drip Tape) – Specifications and Performance Testing
ASAE EP367.2 February 2003	Guide for Preparing Field Sprayer Calibration Procedures
ASAE EP405.1 February 2003	Design and Installation of Microirrigation Systems
ASAE EP458	Field Evaluation of Microirrigation Systems
ASAE S263	Minimum Standards for Aluminum Tubing
ASAE S327.2 February 2003	Terminology and Definitions for Agricultural Chemical Application
ASAE S398.1 January 2001	Procedure for Sprinkler Testing and Performance Reporting
ASAE S435 February 2003	Drip/Trickle Polyethylene Pipe Used for Microirrigation Laterals
ASAE S447 February 2003	Procedure for Testing and Reporting Pressure Losses in Irrigation Valves
ASAE S471 February 2003	Procedure for Measuring Sprayer Nozzle Wear Rate
ASAE S491 February 2003	Graphic Symbols for Pressurized Irrigation System Design

ASTM D-1785	Standard specifications for poly (vinyl chloride) (PVC) plastic pipe, schedules 40, 80, and 120
ASTM D-2104	Standard specifications for - 10 -olyethylene (PE) plastic pipe, schedule 40
ASTM D-2447-03	Standard Specification for Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter
ASTM D-2464-99	Standard specification for threaded poly (vinyl chloride) (PVC) plastic pipe fittings, Schedule 80
ASTM D-2466-02	Standard specifications for socket-type poly (vinyl chloride) (PVC) plastic pipe fittings, Schedule 40
ASTM D-2467-02	Standard specifications for socket-type poly (vinyl chloride) (PVC) plastic pipe fittings, Schedule 80
ASTM D-2468	Standard specification for Acrylonitrile Butadiene Styrene (ABS) plastic pipe fittings, Schedule 40
ASTM D-2469	Standard specifications for socket type Acrylonitrile-Butadiene-Styrene (ABS) plastic pipe fittings, Schedule 40
ASTM D-2609	Standard specifications for plastic insert fittings for polyethylene (PE) plastic pipes
ASTM D-2683-98	Standard specification for socket-type polyethylene (PE) fittings for outside diameter controlled polyethylene pipe
ASTM D-2855	Standard practice for making solvent cemented joints with poly (vinyl chloride) (PVC) pipe and fittngs
ASTM D-3036	Standard specifications for Socket-type poly (vinyl chloride) (PVC) plastic line couplings
ASTM D-3139-98	Standard specifications for joints for plastic pressure pipes using flexible elastometric seals
ASTM D-3261-03	Standard specifications for butt heat fusion polyethylene (PE) plastic fittings for polyethylene (PE) plastic pipe tubing

b. <u>BS Standards</u>

BS 1387: 1985 (1990)	Specification for screwed and socketed steel tubes and tubulars and for plain and for steel tubes suitable for welding or for screwing to BS 21 pipe threads
BS 143 & 1256: 1986	Specification for malleable cast iron and cast copper alloy threaded pipe fittings
BS 21: 1985	Specification for pipe threads for tubes and fittings where pressure tight joints are made on the threads (equivalent to ISO 7/1, 7/2: 1982)
BS 3867: 1987	Method of specifying outside diameters and pressure ratings for pipe of thermoplastics materials (inch series)
BS 4346: Part 1-3	Joints and fittings for use with unplasticised PVC pressure pipes
BS 5556: 1978 (1986)	Specification for general requirements for dimensions and pressure ratings for pipe of thermoplastic materials (metric series) (ISO 161/1)

BSR/ASAE S577-200x	Specification for Poly (Vinyl Chloride) (PVC) Irrigation Pipe (PIP) Fittings

c. DIN Standards

DIN 2440/41/42	Steel tubes (Medium-Weight) Suitable for Screwing
DIN 2999 (1-6)	Pipe threads for tubes and fittings
DIN 8062 (1988)	Unplasticised polyvinyl chloride (PVC-U, PVC-HI) pipes – Dimensions
DIN 8072 (1987)	Pipes of Low-density PE (Low-density Polyethylene) – Dimensions
DIN 8074 (1999)	High-density polyethylene (PE-HD) pipes – dimensions
DIN 8075 (1999)	High – density polyethylene (PE-HD) pipes; Testing
DIN 8161 (1994)	Unplasticised polyvinyl chloride pipes – General quality requirements and testing

d. ISO Standards

ISO 10522: 1993	Agricultural irrigation equipment – Direct-acting pressure-regulating valves
ISO 11419: 1997	Agricultural irrigation equipment – Float type air release valves
ISO 11545: 2001	Agricultural irrigation equipment – Center-pivot and moving lateral irrigation machines with sprayer or sprinkler nozzles – Determination of uniformity of water distribution
ISO 11678: 1996	Agricultural irrigation equipment – Aluminium irrigation tubes
ISO 1167: 1996	Thermoplastics pipes for the conveyance of fluids – Resistance to internal pressure – Test method
ISO 11738: 2000	Agricultural irrigation equipment – Control heads
ISO 11922-1: 1997	Thermoplastics pipes for the conveyance of fluids – Dimensions and tolerances – Part 1: Metric series
ISO 11922-2: 1997	Thermoplastics pipes for the conveyance of fluids – Dimensions and tolerances – Part 2: Inch-based series
ISO 12347: 1995	Agricultural irrigation – Wiring and equipment for electrically driven or controlled irrigation machines
ISO 13457: 2000	Agricultural irrigation equipment – Water driven chemical injector pumps
ISO 13460: 1998	Agricultural irrigation equipment – Plastics saddles for polyethylene pressure pipes
ISO 15873: 2002	Irrigation equipment – Differential pressure Venturi-type liquid additive injectors
ISO 161-1: 1996	Thermoplastics pipes for the conveyance of fluids – Nominal outside diameters and nominal pressures – Part 1: Metric series
ISO 161-2: 1996	Thermoplastics pipes for the conveyance of fluids – Nominal outside diameters and nominal pressures – Part 2: Inch- based series
ISO 3126: 1997	Plastics pipes – Measurements of dimensions

ISO 3460: 1975	Unplasticized polyvinyl chloride (PVC) pressures pipes – Metric series – Dimensions of adapter for backing flange
ISO 3501: 1976	Assembled joints between fittings and polyethylene (PE) pressure pipes – Test of resistance to pull out
ISO 3503: 1976	Assembled joints between fittings and polyethylene (PE) pressure pipes – Test of leak proofness under internal pressure when subjected to bending
ISO 3603: 1977	Fittings for unplasticized polyvinyl chloride (PVC) pressure pipes with elastic sealing ring type joints – Pressure test for leakproofness
ISO 3604: 1976	Fittings for unplasticized polyvinyl chloride (PVC) pressure pipes with elastic sealing ring type joints – Pressure test for leakproofness under conditions of external hydraulic pressure
ISO 49: 1994	Malleable cast iron fittings threaded to ISO 7-1
ISO 7-1: 1994	Pipe threads where pressure-tight joints are made on the threads – Part 1: Dimensions, tolerances and designation
ISO 7-2: 2000	Pipe threads where pressure-tight joints are made on the threads – Part 2: Verification by means of limit gauges
ISO 7714: 2000	Agricultural irrigation equipment – Volumetric valves – General requirements and test methods
ISO 7749-1: 1995	Agricultural irrigation equipment – Rotating sprinklers – Part 1: Design and operational requirements
ISO 7749-2: 1990	Agricultural irrigation equipment – Rotating sprinklers – Part 2: Uniformity of distribution and test methods
ISO 8026: 1995/Amd 1: 2000	Agricultural irrigation equipment – Sprayers – General requirements and test methods
ISO 8224-1: 2003	Traveller irrigation machines -- Part 1: Operational characteristics and laboratory and field test methods
ISO 8224-2: 1991	Traveller irrigation machines -- Part 2: Softwall hose and couplings -- Test methods
ISO 8779: 2001	Polyethylene (PE) pipes for irrigation laterals -- Specifications
ISO 8796: 1989	Polyethylene (PE) 25 pipes for irrigation laterals -- Susceptibility to environmental stress-cracking induced by insert-type fittings -- Test method and specifications
ISO 9260: 1991	Agricultural irrigation equipment -- Emitters -- Specification and test methods
ISO 9261: 1991	Agricultural irrigation equipment -- Emitting pipe systems -- Specification and test methods
ISO 9624: 1997	Thermoplastics pipes for fluids under pressure -- Mating dimensions of flange adapters and loose backing flange
ISO 9625: 1993	Mechanical joint fittings for use with polyethylene pressure pipes for irrigation purposes
ISO 9635: 1990	Irrigation equipment -- Hydraulically operated irrigation valves
ISO 9644: 1993/Amd 1: 1998	Agricultural irrigation equipment -- Pressure losses in irrigation valves -- Test methods
ISO 9911: 1993	Agricultural irrigation equipment -- Manually operated small plastic valves

ISO 9912-1: 2004	Agricultural irrigation equipment -- Filters -- Part 1: Terms, definitions and classification
ISO 9912-2: 1992	Agricultural irrigation equipment -- Filters -- Part 2: Strainer-type filters
ISO 9912-3: 1992	Agricultural irrigation equipment -- Filters -- Part 3: Automatic self-cleaning strainer-type filters
ISO 9952: 1993	Agricultural irrigation equipment -- Check valves
ISO/TR 10501: 1993	Thermoplastics pipes for the transport of liquids under pressure -- Calculation of head losses
ISO/TR 8059: 1986	Irrigation equipment -- Automatic irrigation systems -- Hydraulic control

7. MAJOR ROLE OF SUPPLY AND SERVICE COMPANIES (SSCs)

i) Carry out field surveys using the latest tools

ii) Prepare designs in accordance with accepted standards & specifications

iii) Prepare cost estimates/ bill of quantities

iv) Install drip/ sprinkler irrigation systems at farmers' fields

v) Provide post-installation engineering and agronomic backup support services for at least two years

8. SUBMISSION OF REOIs

Applicant firms are requested to provide only relevant and complete information specific to the proposed assignment and avoid submitting generic promotional literature. Incomplete/ irrelevant/ generic information will not be considered. Any misinformation, false and forged statements will lead to disqualification from pre-qualified and any other action as per applicable laws. The department reserves the right to withdraw this REoI at any time and interested firms are responsible for all costs incurred arising from or in relation to this request.

The REoIs containing eligibility criteria containing last date for submission of proposals has been published in newspapers. The proposals/ applications will be received in the office of undersigned at given address in written form during office hours. A Pre-Qualification Committee (PQC) will evaluate the proposals/ offers and decide about acceptance/ rejection of proposals/ offers. For further details/ pre-qualification information/ clarifications, the firm(s)/ Joint Venture(s) can contact office of the undersigned within office hours.

Project Management Unit (PMU)-PRIAT
Director General Agriculture (Water Management) Punjab
21-Agha Khan Soyyum (Davis) Road, Lahore, Pakistan
Tel: +92-42-99200703 Fax: +92-42-99200702
Email: pipipwm@gmail.com