GOVERNMENT OF THE PUNJAB
Agriculture Department

Project Brief

PUNJAB IRRIGATED-AGRICULTURE PRODUCTIVITY IMPROVEMENT PROJECT (PIPIP)

Directorate General Agriculture
(Water Management) Punjab

RATIONALE

Agriculture plays a central role in Pakistan's economy accounting for over 21 percent in GDP and 90 percent of it comes from irrigated crop lands. The sector has robust forward and backward linkages with almost all major economic sectors by supplying raw materials and utilizing output for key industries. The sector is, however, faced with serious sustainability threats above all rapidly escalating water shortages. Inadequate water availability and its improper use remains the main impediment to low productivity from otherwise highly productive agricultural lands.




The annual surface water available at the farm gate in the Punjab is around 45 million acre feet (MAF), which is grossly insufficient for sustainable irrigated agriculture. A substantial amount of irrigation water (45 MAF) is also lost during its transit and application due to aging conveyance network, uneven fields, and obsolete irrigation practices. These losses are, however, recovered to a great extent by groundwater abstractions of almost 42 MAF, which is in fact of degraded quality. Another serious issue associated with it that of over exploitation of this vital resource as recharge to freshwater areas is only 23 MAF. In nutshell, there exists a gap of nearly 20 MAF to meet crop water requirements for present cropping intensity of 140 percent. The water budget of the Punjab irrigation system is given in **Figure-1**.




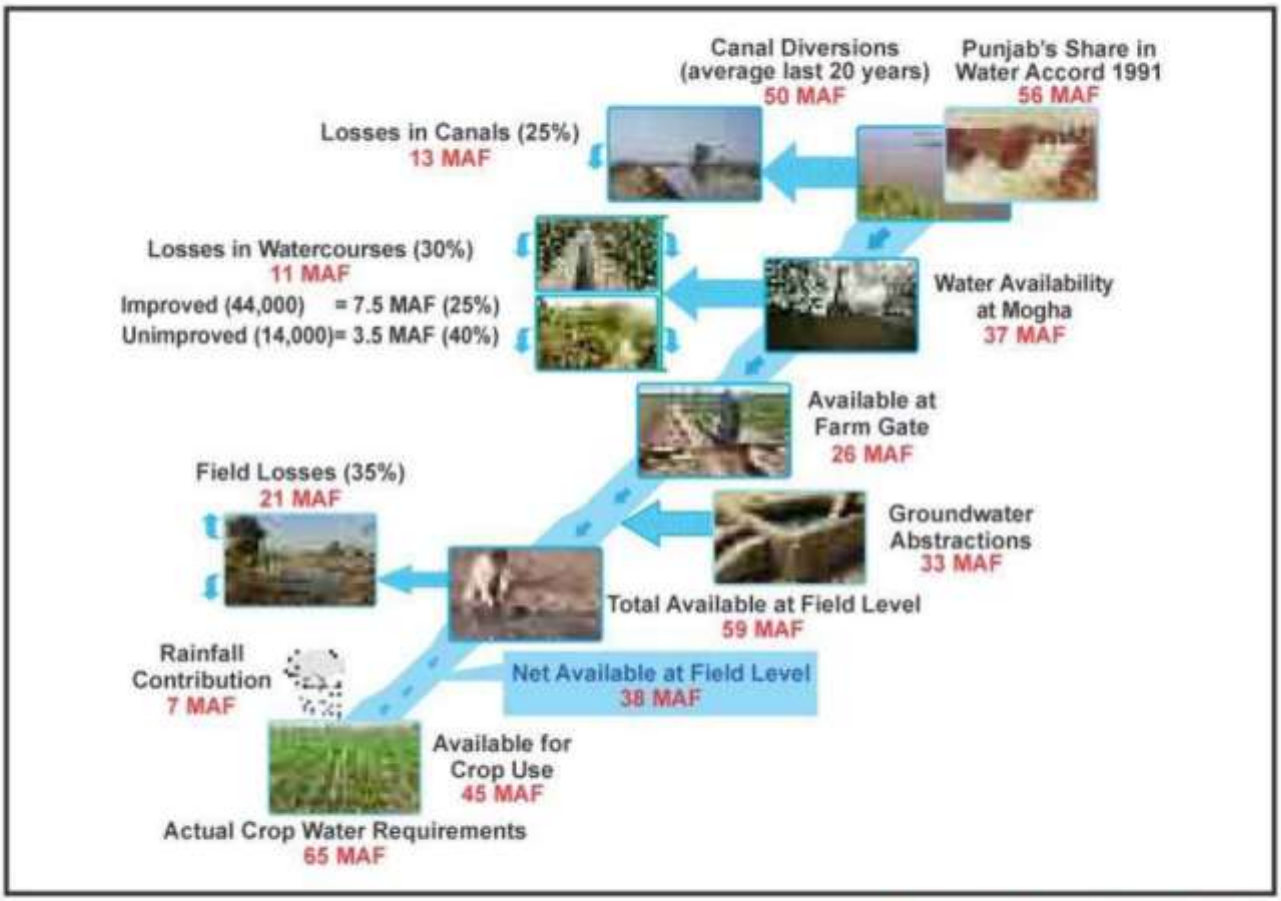

Figure-1: Punjab Water Budget

A robust on farm water management (OFWM) program is under implementation in the Punjab to mitigate adverse irrigation related issues at the farm level. It includes improvement of watercourses for minimizing conveyance losses to improve water availability at farm level, promotion of LASER land leveling to reduce water application losses, adoption of drip/sprinkler irrigation systems to maximize productivity of irrigation water for crop production. All these activities had been implemented successfully as standalone projects and improvements made have contributing significantly towards mitigating the water shortages to a great extent. The Punjab government has recently started the Punjab Irrigated-Agriculture Productivity Improvement Project (PIPIP) by integrating said tested and tried interventions as one package.




PIPIP

SCOPE

The Punjab Irrigated-Agriculture Productivity Improvement Project (PIPIP) envisages developing/upgrading tertiary conveyance system, promotion of high efficiency water conserving technologies like sprinkler/drip irrigation, LASER land leveling, capacity building of all stakeholders, and undertaking action research for acquisition, indigenization, and pilot testing of modern water management interventions to suit the local conditions. The combined effect of these advancements would lead to maximize productivity of available water by minimizing water losses at various levels in order to ensure its adequacy, equity, and reliability at the farm level.





OBJECTIVES

The project development objective (PDO) is to improve water productivity leading to greater agricultural output per unit of water used. It will be achieved through increasing physical delivery efficiency, adoption of efficient irrigation practices, crop diversification, and effective application of inputs.

The project has following key objectives.

I. Improving productivity of irrigation water by efficient conveyance and its effective farm level use by adopting resource conservation agricultural practices.

II. Production of more profitable crops through high efficiency irrigation systems (HEISs) for meeting increasing domestic demand and enhancing exports.

III. Strengthening the private sector service delivery capacity and sustainability for supporting irrigated agriculture.

IV. Capacity building of stakeholders in better managing irrigation water for attaining higher crop yields with less production costs.

KEY COMPONENTS

The project intends to achieve its objectives through implementation of the following activities subdivided into various components.

A. Improving Water Productivity

A-1 Installation of high efficiency irrigation systems (HEISs) on **120,000** acres

A-2 Strengthening of precision land leveling services in private sector through provision of **3,000** laser units to farmers/service providers

B. Upgrading Farm Level Irrigation Conveyance System

B-1 Improvement of **5,500** unimproved watercourses in canal commands

B-2 Completion of **1,500** partially improved watercourses

B-3 Rehabilitation of **2,000** irrigation conveyance systems in non-canal commanded areas

C. Adoption and Promotion of Modern Irrigation Technologies & Practices and Monitoring & Evaluation

- C-1 Adoption and promotion of modern irrigation technologies and practices
- C-2 Monitoring and evaluation of project impacts

D. Project Management, Supervision, Technical Assistance, Training and Strategic Studies

- D-1 Project implementation and management support
- D-2 Implementation supervision and third party validation
- D-3 Strategic studies, technical assistance, training etc.

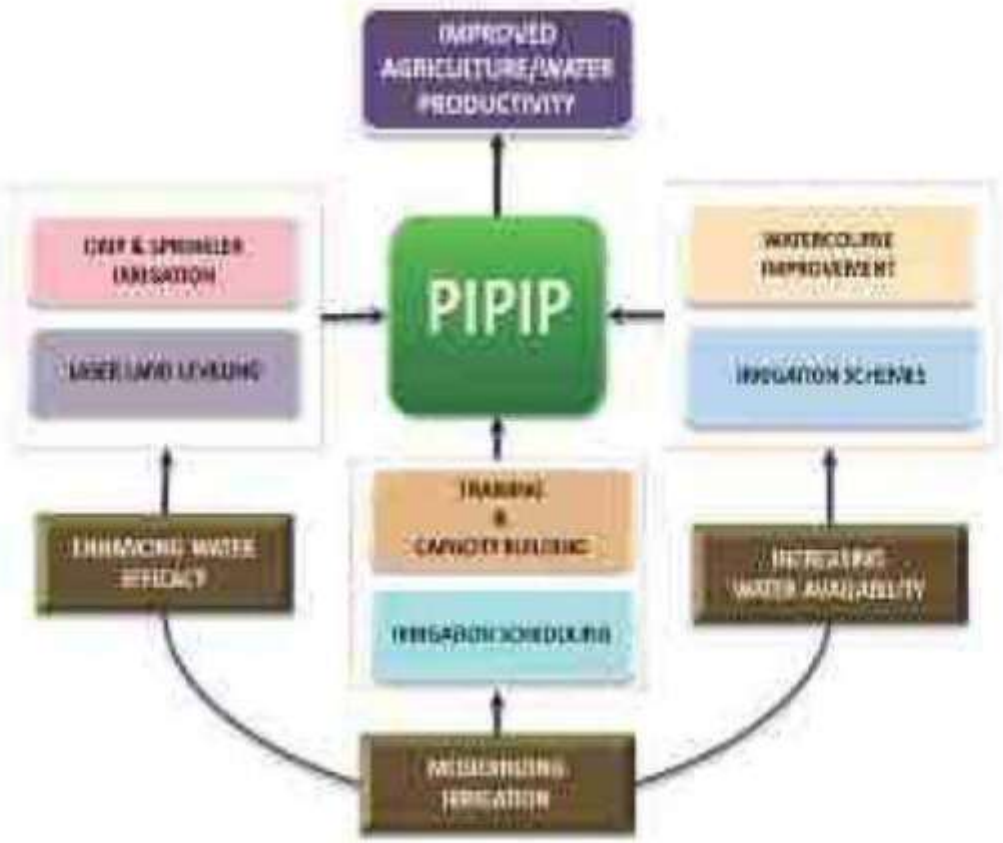

Figure-2: Conceptual Framework

IMPLEMENTATION ARRANGEMENTS

The project is supervised, coordinated, and operated by Directorate General Agriculture (Water Management) Punjab. The District Governments and water users association (WUA) as well as private sector service providers and supply & services companies (SSCs) are the executing agencies with technical assistance and support of OFWM staff and project consultants. Three Regional Project Coordination Units (RPCUs), one each at Lahore, Multan and Rawalpindi, provide necessary technical support to the District Governments as well as coordinate activities between provincial headquarters and field formations.

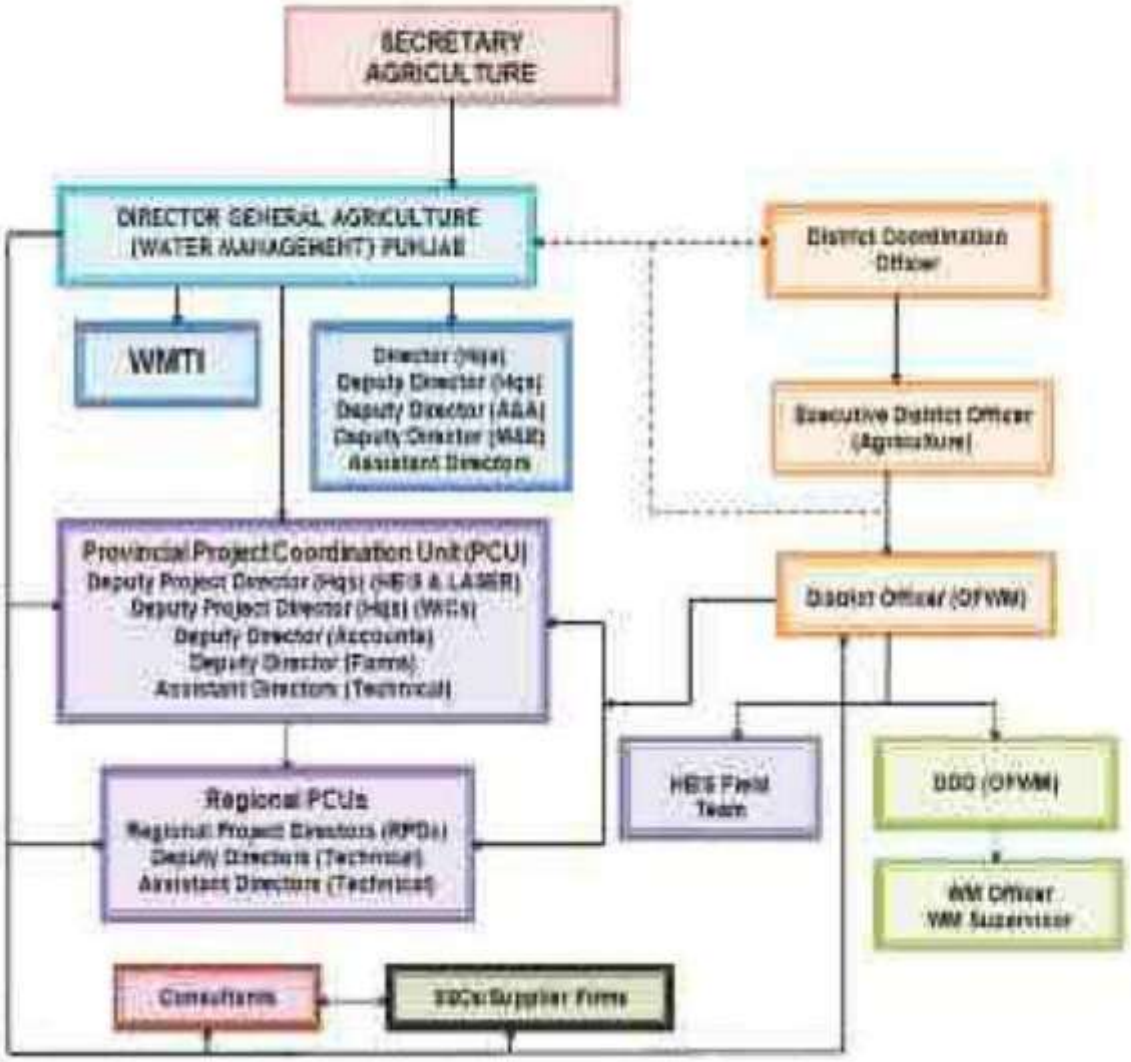

Figure-3: Institutional Arrangements

PROJECT DIGEST

- **Location**
  Entire Punjab
- **Implementation Period**
  60 months (01-07-2012 to 30-06-2017)
- **Sponsoring**
  Punjab Agriculture Department through World Bank
- **Financial Outlay (Rs. Million)**
  - Punjab Government/ World Bank 21,249.997 (US$ 250.00)
  - Farmers 14,750.709 (US$ 173.54)
  - **Total** **36,000.705 (US$ 423.54)**

- **Execution**
  - I) Punjab Agriculture Department through Directorate General Agriculture (Water Management), Lahore
  - ii) District Governments through District Officers (OFWM)
  - iii) Supply & Service Companies (SSCs)/Supplier Firms
  - iv) Project-Implementation Supervision Consultants (PSC)
  - v) Participating Farmers/Water Users Associations (WUAs)
- **Monitoring**
  - i) Directorate General Agriculture (Water Management) Punjab
  - ii) Program Management Unit (PMU)
  - iii) Monitoring and Evaluation (M&E) Consultants
- **Operation and Maintenance**
  - Participating Farmers/ Water Users Associations (WUAs)

PHYSICAL TARGETS AND FINANCIAL IMPLICATIONS

Sr. #	Particulars	Physical		Financial (Million)				%age
		Unit	Scope	Government Share	Farmers' Contribution	Total Cost		
				Rs.		Rs.	US$	
A	**Improving Water Productivity**							
A1	Installation of High Efficiency Irrigation Systems	Acres	120,000	8,230.44 (60%)	5,486.40 (40%)	13,716.84	161.37	38.10
A2	Strengthening of Precision Land Leveling Services in Private Sector	No.	3,000	675.00 (15%)	4,125.00 (85%)	4,800.00	56.47	13.33
	Sub-Total (A)	-	-	**8,905.44 (48%)**	**9,611.40 (52%)**	**18,516.84**	**217.85**	**51.43**
B	**Upgrading Farm Level Irrigation Conveyance System**							
B1	Improvement of Unimproved Canal Irrigated Watercourses	No.	5,500	5,852.73 (60%)	3,914.39 (40%)	9,767.12	114.91	27.13
B2	Completion of Partially Improved Watercourses	No.	1,500	889.53 (53%)	755.67 (47%)	1,625.20	19.12	4.51
B3	Rehabilitation of Irrigation Conveyance Systems in Non-Canal Commanded Areas	No.	2,000	500.00 (52%)	469.25 (48%)	969.25	11.40	2.69
	Sub-Total (B)	**No.**	**9,000**	**7,222.26 (58%)**	**5,139.31 (42%)**	**12,361.57**	**145.43**	**34.34**
C	**Adoption and Promotion of Modern Irrigation Technologies & Practices and Monitoring & Evaluation**							
C1	Adoption and Promotion of Modern Irrigation Technologies & Practices	-	-	595.00	-	595.00	7.00	1.65
C2	Monitoring & Evaluation	-	-	175.00	-	175.00	2.06	0.49
	Sub-Total (C)	-	-	**770.00**	-	**770.00**	**9.06**	**2.14**
D	**Project Management, Supervision, Technical Assistance, Training and Strategic Studies**							
D1	Management and Administration	-	-	3,462.35	-	3,462.35	40.73	9.62
D2	Supervision and Third Party Validation	-	-	804.95	-	804.95	9.47	2.24
D3	Strategic Studies, Technical Assistance and Training etc.	-	-	85.00	-	85.00	1.00	0.24
	Sub-Total (D)	-	-	**4,352.30**	-	**4,352.30**	**51.20**	**12.09**
	G. Total		-	**21,250.00 (59%)**	**14,750.71 (41%)**	**36,000.71**	**423.54**	**100.00**

INSTALLATION OF HIGH EFFICIENCY IRRIGATION SYSTEMS (HEISs)

A. Eligibility Criteria

The Farmer

a) should not have received subsidies for more than 4 hectares through earlier government schemes;
b) has an assured/reliable water source either in his own right or under contract arrangements from neighbouring farmers;
c) agrees to contribute remaining cost of system installation other than contributed by government;
d) must agree to contribute the land and the cost over and above the government subsidy, if the water storage pond is required;
e) is willing to mobilize operation and maintenance expenditure for post installation period;
f) is owner/tenant/lesse and self-cultivator of land (in case of absentee owner, there is well-versed farm manager);
g) is not defaulter of any revenue/financial institution;
h) will not remove or sell or transfer or hand over possession of installed system to any person in any form within three years after installation;
i) agrees to get the operator of irrigation system trained in operation, trouble-shooting/repair & maintenance from SSC/government;
j) abides by the decision of the scrutiny committee and will not challenge it in any court of law;
k) agrees to abide by any other condition specified by the government; and
l) is liable to pay full amount of financial assistance received for the purpose as arrears of land revenue in case of violating any of the conditions specified by the government.




The Farm

a) is easily accessible, preferably frequently visited by the farmers;
b) land is not severely degraded on account of water-logging, salinization, alkalinization etc.
c) is under a cultivated cropping pattern or with adequate potential for successful cultivation and sufficient economic returns, and
d) topography is not broken by the ditches / other obstacles which cannot be resolved through economic design interventions

B. Cost Sharing

The government subsidizes 60 percent of total system cost for installation of HEIS on upto 15 acres while the remaining expenditure is contributed by the beneficiary farmers. In addition, government provides **Rs. 10,000** per acre of scheme area for construction of water storage pond, if needed, on the basis of site specific technical requirements.

C. Implementation Approach

The Agriculture Department has pre-qualified supply and service companies (SSCs) for installation of drip and sprinkler irrigation systems. The SSCs install these systems on turn-key basis and provide post installation engineering and agronomic backup support services with following arrangements.

i. Applications from the farmers are invited through advertisement for installation of drip and sprinkler irrigation systems.

ii. The interested farmers obtain the application form from provincial, regional, district, and tehsil level OFWM offices and submit the filled-in forms along with necessary documents. The application form can also be downloaded from OFWM website (www.ofwm.org.pk).

iii. The applications are scrutinized at district and tehsil level OFWM offices viz-a-viz approved criteria and eligible applicants are advised to approach the SSC of their own choice, from amongst pre-qualified by the Agriculture Department, for survey, design, and cost estimation of the selected HEIS.

iv. The selected SSC submits the design and bill of quantity (BOQ) to the Project-Implementation Supervision Consultants (PSC) for review and approval.

v. The farmer, after approval of design and cost estimates, is advised by District Officer (OFWM) to deposit his/her entire share in the form of pay order/bank draft drawn in favour of selected SSC, which is transmitted to Director General Agriculture (Water Management) for issuance of work order.

vi. DGA (WM) issues the work order and advises the concerned SSC to supply the equipment/material at site which is verified by the PSC in terms of quality and quantity viz-a-viz approved standards/specifications.

vii. The spot checking is carried out by RPD, HEIS Field Team of concerned district, and PSC to ensure installation as per approved design parameters.

viii. DGA (WM) makes 50 percent payment of total system cost to concerned SSC on receipt of satisfactory report from PSC along with the advice to install the system.

ix. On completion of installation and making the system functional, PSC verifies the final completion on request of DO (OFWM) as per design, satisfaction certificate of farmer, irrigation & fertigation schedules, log book, certificate that farmer has been trained about system operation & maintenance and O&M manual provided to the farmer.

x. DGA (WM) pays remaining cost to concerned SSC after retaining 10 percent of total system cost, which is released after two years or presentation of bank guarantee of an equal amount to ensure free service during two years warranty period.

xi. The HEIS team in the district provides 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.




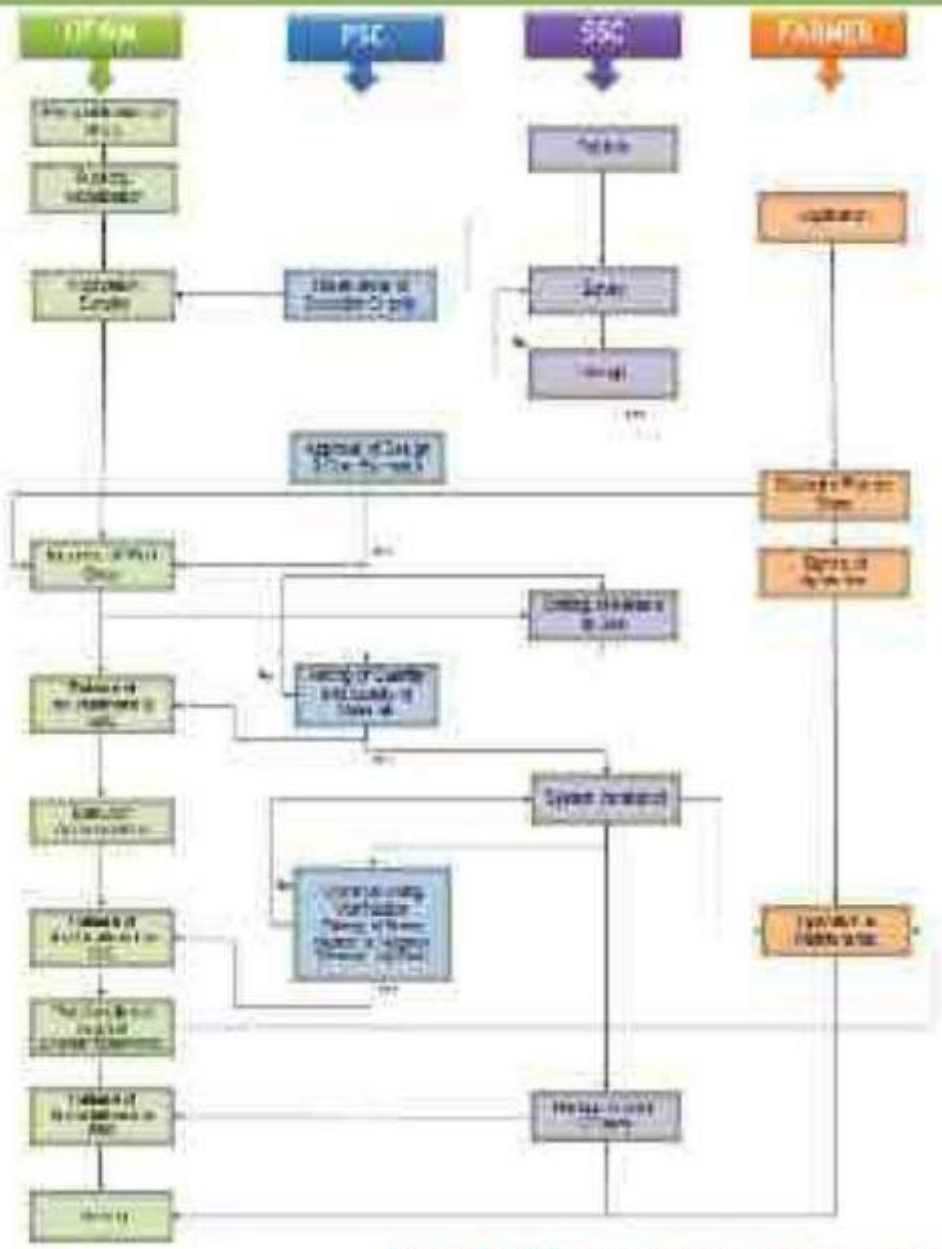

Figure-4: HEIS Implementation Arrangements

D. Impact of HEIS

The impact evaluation studies for drip irrigation undertaken by technical committees constituted by Agriculture Department for sugarcane, citrus, and potato show following impacts.

- Increase in water use efficiency by 40-50 percent
- Enhancement of yield from 34-105 percent
- Reduction in mortality rate to only 1-2 percent against 10-15 percent under surface flooding
- Adoption of high density orchard plantation for higher yields
- Uniform size & shape and better color fruit
- Easy, precise, efficient and uniform nutrient application

STRENGTHENING OF PRECISION LAND LEVELING SERVICES

A. Selection of Service Providers/Farmers

An applicant is 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 and is preferably agricultural machinery service provider or an agricultural graduate possessing requisite land ownership;

iii. agrees 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. is 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.




B. Cost Sharing

One time financial assistance of **Rs. 225,000** per unit is provided to the farmers/service providers.

C. Implementation Strategy

I. Agriculture Department invites applications through advertisement in the press from the farmers interested to work as service providers for LASER land leveling rental services.

ii. The applications are received / collected in the office of DO (OFWM) within a stipulated time period, which are scrutinized for short listing of applications viz-a-viz approved criteria by the designated committee with the assistance from PSC. The list of eligible applicants is displayed outside the offices of Deputy District Officers (OFWM) and District Officer (OFWM).

iii. DO (OFWM) conveys the complete list of eligible applicants to the DGA (WM) for confirmation of district wise quotas as the activity is demand driven.

vi. All districts are informed to proceed further for allotment of LASER units to eligible applicants by following District Allotment Committee (DAC).

a)	District Coordination Officer	Chairman
b)	Executive District Officer (F&P)	Member
c)	Executive District Officer (Agriculture)	Member
d)	Additional District Collector (Revenue)	Member
e)	Regional Project Director, RPCU	Member
f)	District Officer (OFWM)	Member/Secretary

v. In case of less number of eligible applicants than allocated quota, the extra LASER units are allocated to other districts where demand is higher than the available quota for the district.

vi. Workshops are organized at district level, wherein the pre-qualified firms/SSCs exhibit and demonstrate their equipment to facilitate allottees in selection of the firm/equipment of their choice.

vii. Each allottee has to book LASER unit with pre-qualified firm within 30 days of allotment by submitting original draft of his/her entire/full share, drawn in favour of selected firm of his/her choice, to DGA (WM) through concerned DO (OFWM).

viii. Director General Agriculture (Water Management) issues 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 DO (OFWM).

ix. The supplier firm ensures delivery of booked unit within stipulated period and defaulting firms are dealt as per government rules. In case of failure of a firm to deliver the unit within specified time, the farmer has the choice to book the LASER unit with one of the other pre-qualified supplier firms through concerned DO (OFWM) and DGA (WM).

x. A committee comprising of Assistant Director Technical (ADT) of concerned district & regional project coordination unit, recipient farmer/service provider, and PSC inspects the equipment jointly under the supervision of DO (OFWM) and records the make, model, serial number and other features of all components of LASER unit. The technical inspection report, duly signed by the inspection team, is sent by DO (OFWM) to DGA (WM) for releasing payment.

xi. Director General Agriculture (Water Management) hand overs the original draft of concerned allotee's share to the firm along with project assistance.

xii. The farmers/service providers are trained about operation and maintenance of LASER units, trouble shooting of equipment etc. by Water Management Training and Research Institute (WMTRI), Lahore.

D. Benefits of LASER Land leveling

LASER land leveling is an ideal intervention for improving water application efficiency and enhancing crop yields. An impact assessment study carried out by Planning and Evaluation Cell of Agriculture Department during 2008 reveals its following impacts.

- Saving in irrigation time from 25.1 to 32.1 percent
- Increase in irrigated area by 34.5 to 42.0 percent
- Improvement in crop yields from 10.7 to 12.9 percent
- Reduction in farm cultureable waste land by 2.10 percent
- Facilitation in better crop stand, uniform moisture availability and enhanced fertilizer use efficiency




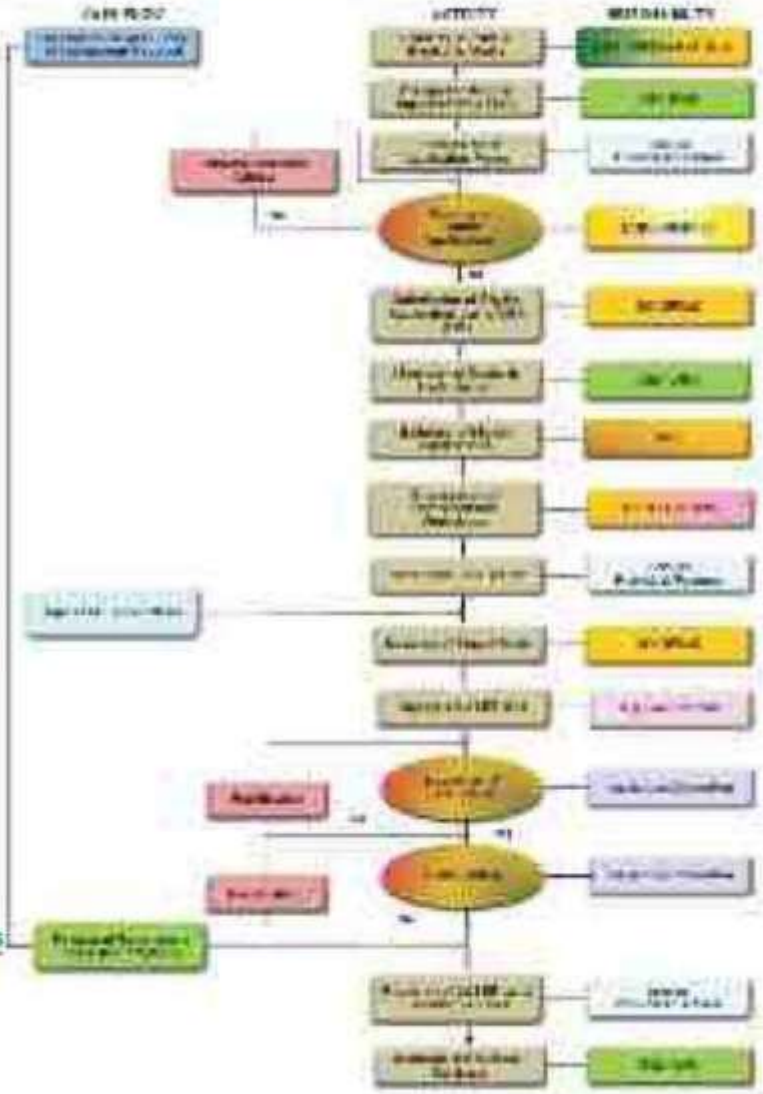

Figure-5:
Provision of Laser Land Leveling Services

UPGRADING FARM LEVEL IRRIGATION CONVEYANCE SYSTEM

The project supports improvement of **5,500** canal irrigated watercourses, completion of **1,500** partially improved watercourses, and rehabilitation of **2,000** irrigation conveyance systems in non-canal commanded areas.

A. Improvement of Unimproved Canal Irrigated Watercourses

Selection Criteria

The following criteria is adopted to take up watercourses for improvement under Punjab-Irrigated Agriculture Productivity Improvement Project (PIPIP).

a) Watercourse has not been previously improved.
b) The farmers are willing to form a water users association (WUA) and agree with the cost sharing arrangements approved under the project.
c) The shareholders agree to re-construct katcha portion of the watercourse prior to commencement of lining.
d) Sections of watercourse to be lined are 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.

B. Implementation Strategy

i. Agriculture Department launches awareness campaign through electronic and print media for watercourse improvement and its benefits.

ii. The tehsil level OFWM staff mobilizes shareholders of the watercourses to organize Water Users Associations (WUA). The same are registered under OFWM and WUAs Ordinance [Act] 1981 (Amended 2001).

iii. The WUA opens a joint account to be operated by its Chairman and Treasurer in a Commercial Bank. The WUA provides bank statement along with the specimen signatures of Chairman and Treasurer to DDO (OFWM) who forwards the same to DO (OFWM).

iv. The WUA executes an agreement with District Officer (OFWM) wherein, roles and obligations of both the parties are defined. The agreement is based on payments linked with pre-defined achievement of physical milestones.

v. The OFWM staff in the respective tehsil conducts engineering surveys of the watercourse command area and prepares design and cost estimates in consultation with WUA that are checked/verified by PSC. The competent authority accords Technical Sanction.

vi. The WUA carries out earthen improvement of 50 percent of proposed length under the supervision of OFWM field staff which involves removal of shrubs, bushes, and vegetation as well as other natural or man-made obstructions from the right of way that is followed by demolishing of existing channel, constructing a well compacted pad, and excavation of new channel as per design.

vii. The WUA procures the construction materials on the rates fixed by the District Rate Committee for the tehsil/cluster and carries out civil works under technical supervision of OFWM field staff.

viii. DO (OFWM) makes internal monitoring of improvement works while Deputy Project Director (Watercourses) undertakes external monitoring to ensure quality of works. The PSC carries out spot checking and third party validation/final verification of improved works.

ix. The requisite funds are released from Account-IV into joint account of the WUA by District Officer (OFWM) in three installments as per following criteria.

First Installment

Release of 40 percent of the estimated cost on receipt of first intermediate completion report (ICR-I) from the consultants certifying following requirements.

a. Issuance of Technical Sanction by the competent authority.

b. Deposit of 50 percent farmers' share on account of labour charges for lining and installation of water control structures.

c. Renovation of at least 50 percent of designed earthen sections.

Second Installment

Release of 30 percent of the estimated cost on receipt of second intermediate completion report (ICR-II) from consultants verifying followings.

a. Deposit of remaining 50 percent labour charges of farmers' share on account of lining/installation of water control structures etc.

b. Renovation of entire designed earthen sections.

c. Completion of at least 30 percent planned lining and other works (volumetric basis).

Third Installment

Release of remaining 30 percent of the estimated cost on receipt of final completion report (FCR) from consultants certifying following factors.

a. Completion of all planned works.

b. Rectification of any pending discrepancy.

Figure-6: Activities and Responsibilities Regarding Watercourse Improvement

C. Completion of Partially Improved Watercourses

Lining of watercourses upto 50 percent length was found technically and economically feasible way back in 1980's but it was limited upto 30 percent due to financial constraints to provide wider coverage of program with limited available financial resources. A large number of watercourses improved during last 35 years have, however, been lined much lower than the permissible limit, or only nakkas have been installed, owing to funding constraints, farmers' financial capacity, lack of awareness etc. Although, it is needed to undertake watercourse lining upto 50 percent of entire watercourse length keeping in view the demand of the farmers, technical feasibility, cost effectiveness and current water economics, the financial constraints still do not permit it yet. It is, accordingly, planned to complete lining upto 30 percent on **1,500** already improved watercourses under the project.

The uniform and transparent selection criteria are followed for completion of partially improved watercourses as given below.

a) The entire cost recovery pertaining to previous improvements, pending if any, is deposited by the farmers into proper head of government account.

b) Only those watercourses that were improved prior to National Program for Improvement of Watercourses (NPIW) are eligible for undertaking additional works under PIPIP.

c) The procedure for undertaking additional works on the already improved watercourses are as follows.

   i) A complete case accompanied with inventory of previously executed works and those planned to be covered under PIPIP, duly marked on the topo map, are submitted to the PSC for its scrutiny, checking, and approval.

   ii) The PSC checks and approves the designs and cost estimates, holds spot checking during execution of the scheme, and finally certifies the completed works.

   iii) The PSC reviews the design and performance of existing lined section of the watercourses to recommend modification in design and upgradation of the section for improving its efficiency.

   iv) Nakkas, culverts, and other structures are installed on only sanctioned / approved points.

Cost Sharing

The government provides entire cost of construction materials besides providing technical guidance while the beneficiary farmers contribute entire labour costs for improvement of unimproved watercourses as well as completion of partially improved watercourses as per following provisions.

Farmers	Government
Contribute entire labour costs for: a) Demolishing and reconstruction of katcha watercourse b) Excavation for the portion to be lined c) Back earth filling of structures and lined section d) Masons and unskilled la bour of all civil works	Provides entire material costs for: a) Lining and structures b) Technical assistance and supervisory support

D. Rehabilitation of Irrigation Conveyance Systems in Non-Canal Commanded Areas

The rehabilitation works on irrigation schemes in non-canal commanded area are some what different than the conventional improvement of canal commanded watercourses. Mostly piped water distribution network replaces the existing earthen channels. In case, the cultivatable area is at higher elevation than the water source, irrigation of fields is carried out by lifting the water. Such irrigation scheme generally includes, interalia, following components.

- Lifting of the irrigation water from the natural nallahs and low-lying water ponds through pumping devices.
- Conveying the water to the fields situated at higher elevations through GI, RCC, and PVC pipes.
- Supplying water to the fields of lower or equal elevation through open channels.
- Connecting different fields having depressions in between through RCC or PVC pipes.
- Providing nakkas and turnouts at water distribution points.

The rehabilitation of water conveyance network of existing irrigation schemes as well as develop such new schemes at suitable sites is being carried out on the basis of demand and feasibility for promoting irrigated agriculture in non-canal commanded areas as per following procedure.

a) The OFWM staff mobilizes shareholders of each irrigation scheme/watercourse to organize water users associations (WUA). The same is registered under OFWM and WUAs Ordinance [Act] 1981 (Amended 2001).

b) The WUA executes an agreement with DO (OFWM) wherein, roles and obligations of both the parties are defined.

c) An account is opened in a Commercial Bank to be operated jointly by WUA Chairman and Treasurer.

d) The OFWM field staff conducts engineering surveys of the command area and prepares design and cost estimates in consultation with WUA that are checked / verified by PSC. The competent authority accords the Technical Sanction.

e) The WUA executes, facilitates, monitors, and supervises the works for their quality as well as responsible for dispute resolution, provision of land for irrigation scheme/watercourse right of way, and labour cost for installation of water control structures, lining etc. as well as material cost over and above the project assistance.

f) After completion of earthen watercourse construction, nakkas are installed and culverts are constructed. The lining of critical reaches of watercourse is carried out subsequently.

g) The OFWM staff provides technical assistance to WUA for watercourse development activities. DDO (OFWM) makes frequent visits at sites to ensure that field staff is regular in supervising the works and prescribed standards / specifications are being followed as well as offers the completion report to the PSC for final verification.

Cost Sharing

The government provides cost of construction materials up to a maximum of Rs. 250,000 per scheme while the farmers contribute labour costs as well as cost of materials over and above the project assistance.

E. Benefits of Watercourse Improvement

A recently completed "Project Impact Evaluation Study (PIES) for the Project National Program for Improvement of Watercourses in Pakistan (NPIWC)" got conducted by the Planning Commission of Pakistan reveals that watercourse improvement is highly cost effective option for improving water productivity. The salient findings highlighted therein are summarized hereunder.

Sr. #	Impact	Extent (%)
1	Annual water saving (Acre feet)	122
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	Curtailment in saline area	87

ADOPTION AND PROMOTION OF MODERN IRRIGATION TECHNOLOGIES AND PRACTICES

The farmers in the Punjab normally follow traditional irrigation practices due to lack of access to modern techniques and technologies. There is, therefore, a huge gap in amount of water being applied and actual irrigation requirements, which can be curtailed by modernizing application methods and scheduling the irrigation on scientific basis. More importantly, orthodox guess work of plant and soil feel/appearance for irrigation is needed to be replaced with scientific measurement and monitoring of soil moisture for accurate determination of "*WHEN and HOW MUCH water to apply to a field*". Furthermore, introduction of drip and sprinkler irrigation technologies are at nascent stage. Their promotion requires intensive awareness amongst all stakeholders and involves a complete paradigm shift from archaic traditional surface irrigation technologies and associated agricultural practices. A multipronged approach is needed to address all these issues.

Water Management Training and Research Institute (WMTRI) of Directorate General Agriculture (WM) has, accordingly, been assigned creation of awareness among farming community, demonstration of envisaged improved water management interventions, establishment of information desks / kiosks, applied research & devolvement (R&D), and training & capacity building of stakeholders.

Figure-7: Adoption of Modern Irrigation Techniques and Technologies

WATER MANAGEMENT ACTIVITIES

LASER Land Leveling

Watercourse Improvement

Sprinkler Irrigation

Drip Irrigation

Bed & Furrow Technology

Solar Water Pump

Hydro Flume Irrigation

Flexible Pipe Irrigation

Directorate General Agriculture

(Water Management) Punjab

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