



# PMS Method Irrigation Project Guidelines

Secure Water and Food



## Guidelines

Japanese / English / Dari / Pashto  
A4 size / 368 pages / full color

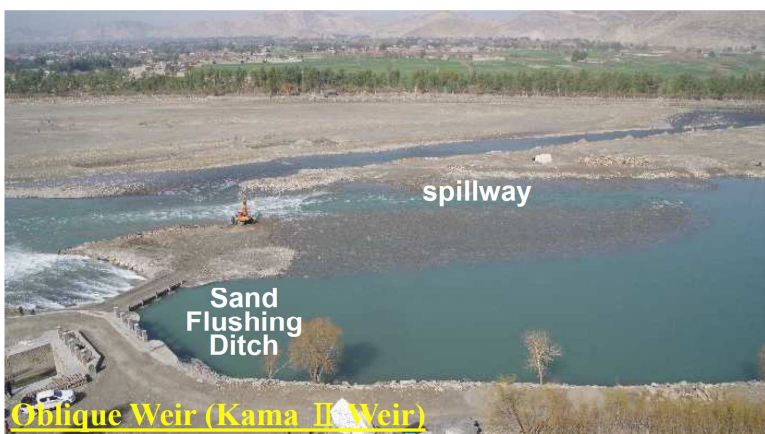
## DVD

Japanese / English / Dari / Pashto  
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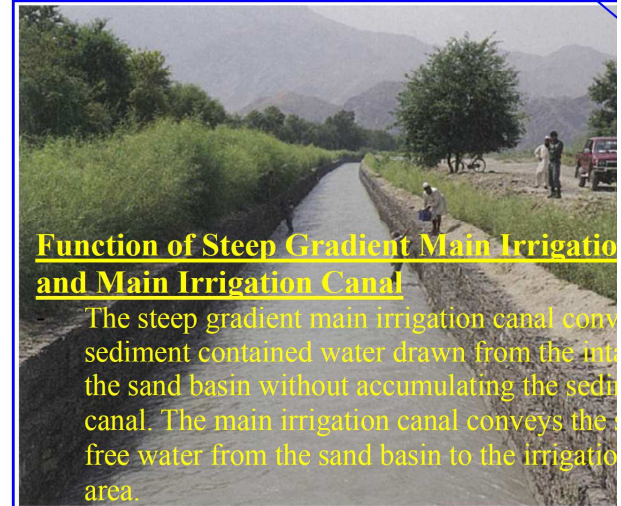
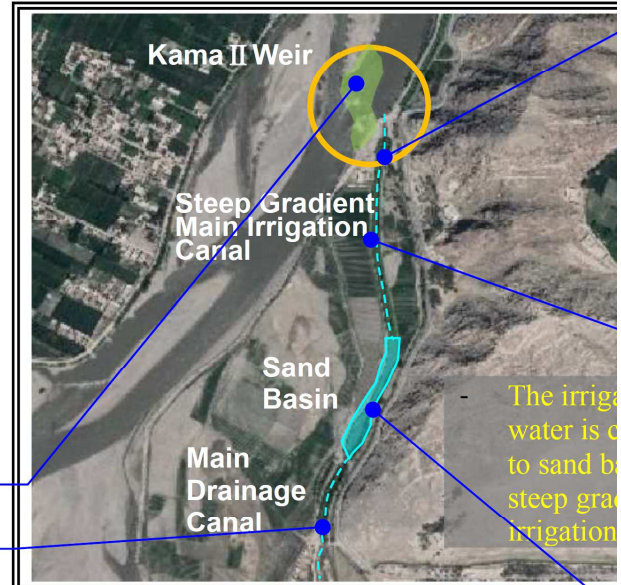
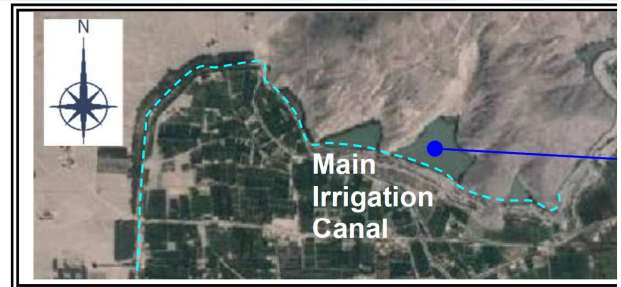
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Supervised by PMS



# Functions of PMS Method



- Menu of PMS Method Irrigation Features
- Oblique Weir with Boulders / Intake with Double Flush Boards
  - Main Irrigation Canal with Gabion Wicker Works
  - Sand Basin (Regulating Pool)
  - Reservoir, Siphon, Flood Crossing
  - Main Drainage Canal
  - Dike and Stone Spur dike



# Good Irrigation Facilities

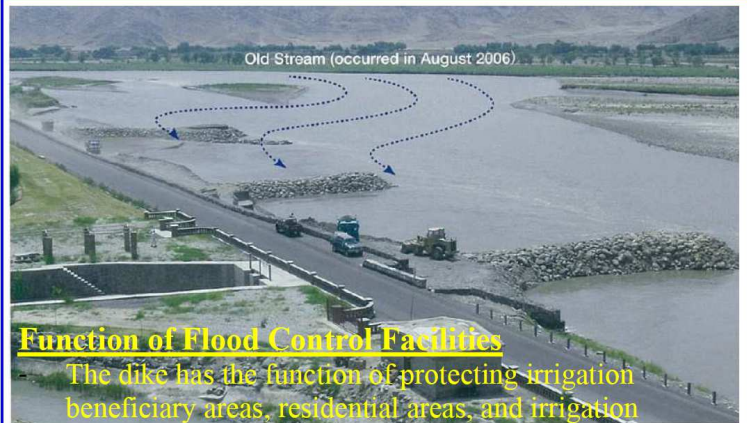
Facilities  
Intake Gate  
and  
Diversion and  
(and)  
Long Bridge  
ke



### Function of Reservoir etc.

To protect the irrigation canal from flash floods and debris flows from the foot of the mountain.

- When crossing existing waterways and rivers, siphons and flood crossing bridges are provided.
- To secure water retention in dry areas and contribute to the growth of vegetation.



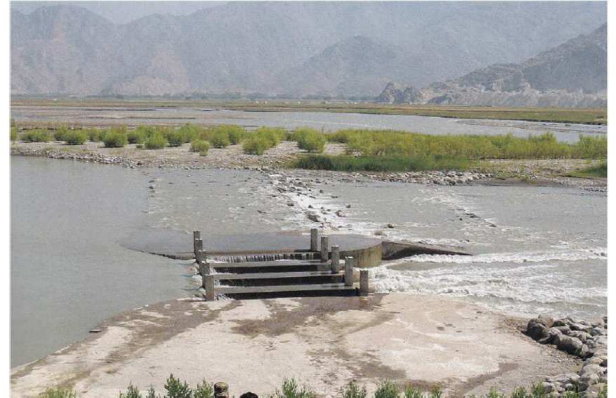
### Function of Flood Control Facilities

The dike has the function of protecting irrigation beneficiary areas, residential areas, and irrigation canals along the river from floods.

- The stone spur dike prevents dikes and riverbanks from scouring and also has the function of fixing the alignment of river channel.

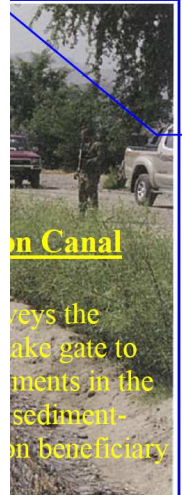


ation  
conveyed  
basin via  
gradient main  
canal.



### Function of Intake Gate

- The intake gate is installed at the downstream end of oblique weir to draw water into the irrigation canal and adjusts the amount of intake water.
- Two rows of flush boards are installed in front and rear of the gate pier to create a reservoir. It reduces the water pressure applied to the lower flush board on the river side and prevents the flush board from breaking.



### on Canal

veys the  
ake gate to  
ments in the  
sediment-  
on beneficiary



### Function of Sand Basin (Regulating Pond)

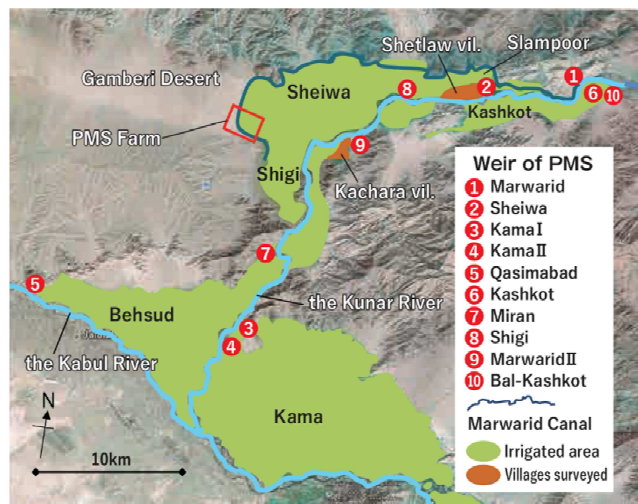
Sedimentation and flushing out of earth and sand contained in the irrigation water.  
Control of transmission water amount.



Drainage Canal in Sand Basin

## Activities and Outputs of PMS Irrigation Project

Since moving to Pakistan in 1984, Dr. Tetsu Nakamura has established PMS (Peace (Japan) Medical Services) where he served as the executive director and conducting medical activities, mainly in eastern Afghanistan. In the wake of the 2000 drought across Afghanistan, Dr. Tetsu Nakamura believed that "it is better to construct one irrigation canal than 100 clinics". Agriculture was essential for people's health, and in 2002 he aimed at the reconstruction of the northern granary of Jalalabad. "Green ground project, 15-year plan" thus started. The PMS irrigation project started in 2003. By now (2020), the PMS irrigation project has revived 16,500 hectares of the cultivated land to support the livelihoods of 650,000 farmers and has produced great economic and social results. The PMS irrigation project utilizes locally available materials and equipment. It uses simple and practical techniques which combine traditional civil engineering techniques of Afghanistan and Japan, applied through trial and error. As a result, it is possible for the local residents to maintain and restore the facility by themselves.



Project Area in "Green Ground Project"



Dr. Tetsu Nakamura said that water is more important than anything else to live.

Main performance indicators	before	after
Average number of meals per household (times / day)	2.6	3.0
Average household food cost ratio (%)	64	33
Average household income (1,000Afs/Year)	98	256
Agricultural income ratio (%)	5	55

Most farmers are now able to have three regular meals a day. Their incomes have improved, even smaller farmers can save money. They can go to the hospital for treatment.

Outputs of the PMS Irrigation Project  
(results of interview survey with farmers)



Many displaced persons returned to the village and settled.  
Agricultural incomes increased.  
Many children were able to attend school.



Oblique weir with boulders in the PMS irrigation project  
(Modeled after Yamada Weir made with traditional Japanese techniques)



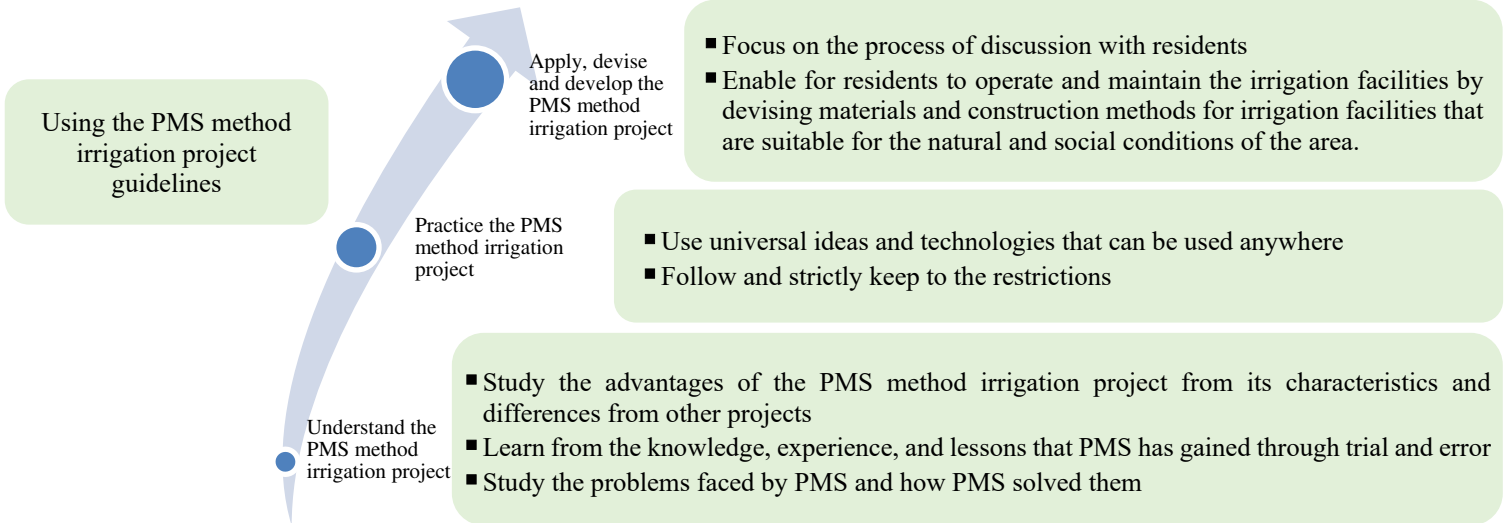
Gabion, which is one of the basic civil engineering techniques of the PMS irrigation project, is installed on the side of the canal.

# What is the "PMS Method Irrigation Project Guidelines"?

This guideline is a technical document that describes in an easy-to-understand manner the process from the basic concept of the PMS method irrigation project to survey, design and construction. The purpose of the Guidelines is to disseminate the PMS method irrigation project throughout Afghanistan.

Promotion of sustainable irrigation projects suitable for Afghanistan which enable the operation and maintenance of the local community

Dissemination and utilization of the PMS method irrigation project in the whole country of Afghanistan



## How Should a PMS Method Irrigation Project with the Farmers be Launched?

In order to implement the PMS method irrigation project, it is important to clarify the natural conditions of the area and confirm the willingness and ability of the local community to implement the PMS method irrigation project. The PMS method irrigation project is a project that prepares a basic concept together with the local community and is operated and maintained by the local community. Suitable location of the intake weir is of utmost importance to enable stable water intake during both drought and flood seasons. At that time, it is important to give due consideration to the impact on the opposite banks, upstream and downstream.

### Selection of Areas Suitable for PMS Method Irrigation Projects

Primary Selection: Desktop

Selected from the list of existing contender sites by the Government

lands at request from the local community

Secondary Selection: Desktop + Field survey

Natural Conditions (Hard)

land

Irrigation water

Construction materials

Possibility of securing land with high crop productivity

Possibility to stably take in the required amount of irrigation water

Availability and access to construction materials such as boulders

Tertiary Selection: Field survey

Socio-Economic Conditions (Soft)

Local community situation

Farmers' situation

Farmers' organizational Structure

Most important thing

- Is the community willing to implement a PMS irrigation project?
- Is the community willing to properly operate and maintain the irrigation facilities?
- Does the community have that ability?
- Be sure to go to the site and check the history and current situation through interviews with farmers.
- Let the local people talk.

Determination of Target Area

### Selection of suitable site for intake weir in PMS method irrigation project

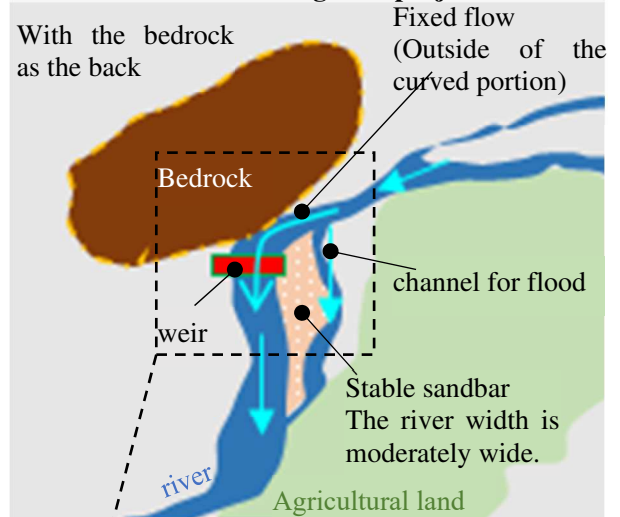
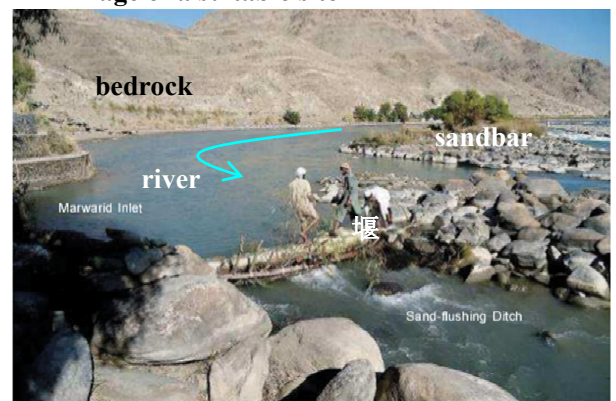


Image of a suitable site



## Formulation of Basic Concept Through Consultation and Agreement with Local Communities

Contents of Discussions and Agreements	Allocation of Roles	
	<u>Project Implementation Entities /Persons</u> Central Government /Province, etc.	<u>Local Communities</u> Self-governing body (Community Development Council /Shura/Jirga) Association (Water Users' Association/ Irrigation Association) , etc.
Irrigation beneficiary area, project effects, estimated project cost, maintenance cost, project period	Investigate and examine the items on the left related to the basic concept, discuss and revise the examination results with the local community, reach consensus, and formulate the basic concept.	Cooperate with the survey and planning of the project implementation entities/persons, confirm the presented examination results, discuss and coordinate with the project implementation entities/persons, discuss inside the local community to form an agreement, and finally approve the basic concept.
Land acquisition (irrigation facilities: main irrigation canal route, etc.)		
Impact on the surrounding area (risks)		
Residents participation in construction projects and operation and maintenance of irrigation facilities		
Security and safety		

### Basic policy for discussions and agreements with residents

- Stay neutral and get support from self-governing bodies and governments.
- Facilitate communication with local communities.
- Maintain publicity so that irrigation projects do not contribute to the induction of personal interests.
- Do not upset the balance of the region.

## What and How Should Water Source Rivers be Understood?

Obtain as much information and data as possible, such as river topography and discharge, from existing data bases. Conduct interviews with local residents, who are familiar with the local situation, to obtain more information. In addition, observe, measure, and survey the local situation thoroughly. Organize the information, data, disaster history and downstream impacts, that form the basis of the plan and design of the PMS method irrigation project.

River Conditions to be Comprehended	How to Grasp River Conditions
<ul style="list-style-type: none"> <li>▪ River basin conditions</li> <li>▪ River channel conditions</li> <li>▪ River flow conditions (flood and drought conditions)</li> <li>▪ Impact of river structure construction on river flow and channel</li> <li>▪ Impact of irrigation water extraction on downstream water use</li> </ul>	<ul style="list-style-type: none"> <li>▪ Collection and organization of existing information</li> <li>▪ Interview survey among residents</li> <li>▪ Observation and measurement of river conditions and their arrangement</li> <li>▪ River survey and survey study</li> </ul>

## How Should Irrigation Facilities and Flood Control Facilities Be Planned and Designed?

The irrigation facilities and flood control facilities of the PMS method irrigation project should be planned and designed in such a way that the required amount of irrigation water can be stably extracted even during the drought season and the damage to the water intake facilities during the flood season should be minimized.

### Irrigation Facilities

(1) Existing farmland, intake mouths and irrigation canals are confirmed. Irrigation beneficiary areas will be set in consultation with farmers.

(2) A steep gradient main irrigation canal is routed at the shortest distance from the new intake point to the target conveyed area.

(3) A sand basin is located near the existing intake mouth that is closest from the new intake point, and regulating ponds are located downstream of it.

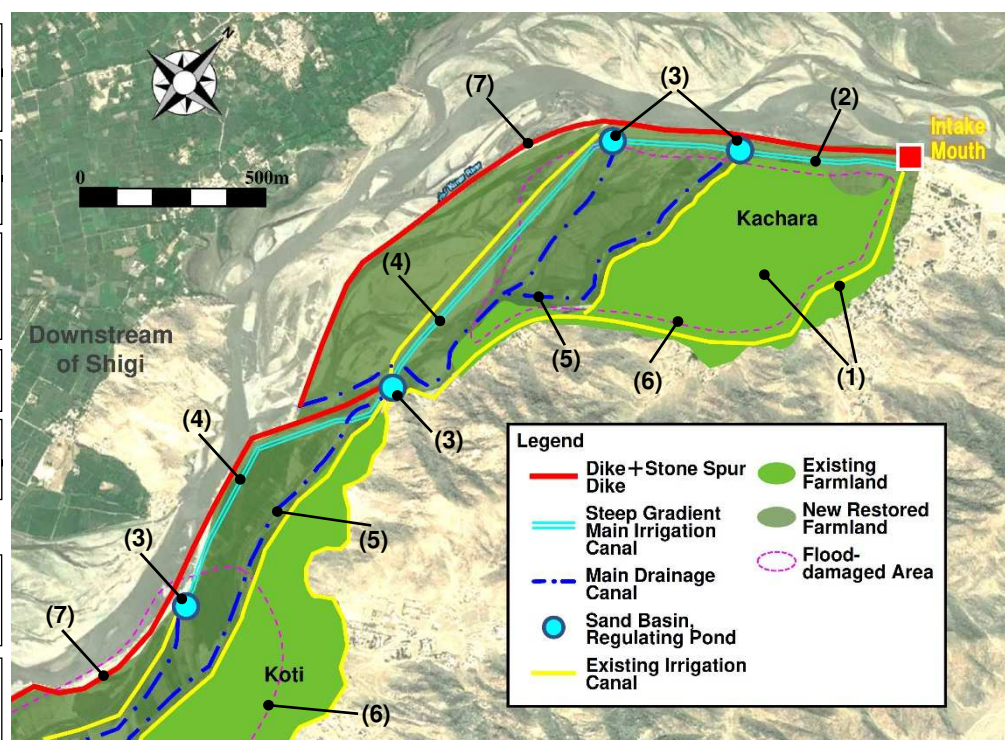
(4) The main irrigation canals are located downstream from the sand basin.

(5) The main drainage canals are located in lowlands where there are concerns about wetlands.

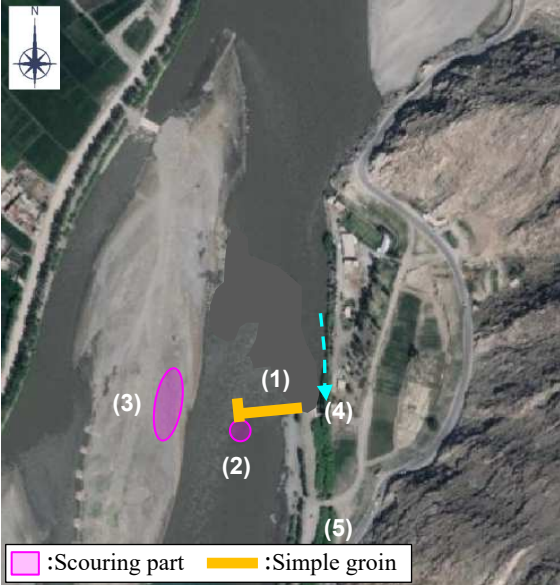
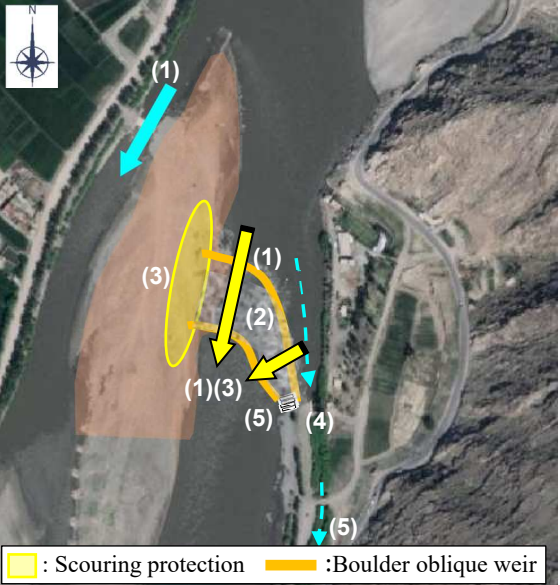
### Flood Control Facilities

(6) From the flood damage historical record, the places where there is a high possibility of flooding and erosion can be grasped.

(7) Dike and stone spur dikes are provided in the minimum section. Dikes on both side banks shall be avoided.



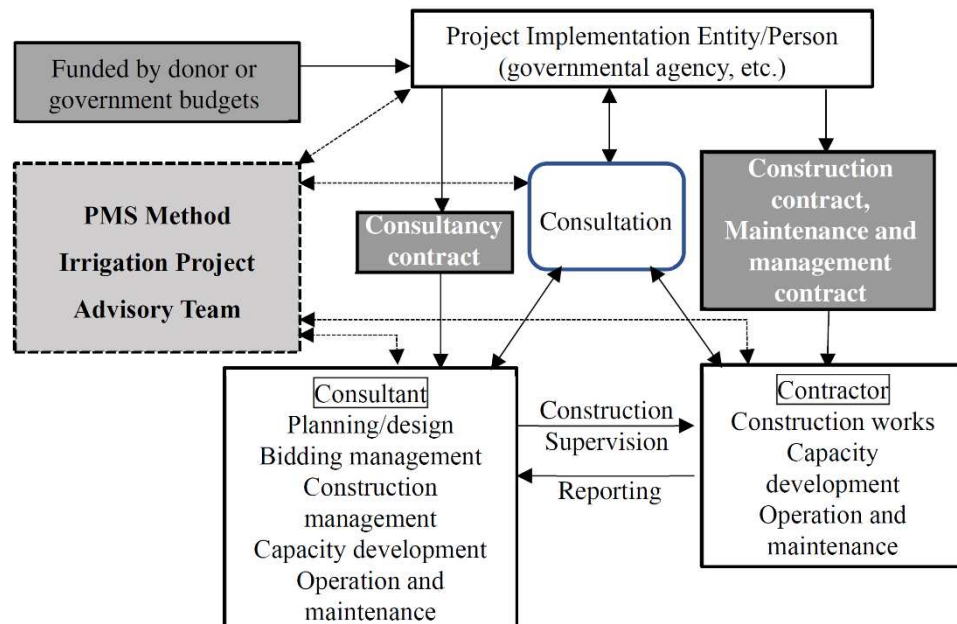
## Advantage of Boulder Oblique Weir in the PMS Method Irrigation Project to Conventional Intake Weir

Conventional Intake Weir (Simple groin)	Boulder Oblique Weir in PMS Method Irrigation Project																				
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<p><b>Issues</b></p> <table border="1" data-bbox="119 705 774 1288"> <tr> <td data-bbox="119 705 199 817">(1)</td> <td data-bbox="199 705 774 817">- There is concern about possibility of washout or destruction of the weir itself.</td> </tr> <tr> <td data-bbox="119 817 199 929">(2)</td> <td data-bbox="199 817 774 929">- It is difficult to secure the water intake level because the weir body is broken due to riverbed decline by scouring.</td> </tr> <tr> <td data-bbox="119 929 199 1041">(3)</td> <td data-bbox="199 929 774 1041">- River water route moves due to opposite side bank scouring, and the water cannot flow into the intake mouth.</td> </tr> <tr> <td data-bbox="119 1041 199 1086">(4)</td> <td data-bbox="199 1041 774 1086">- There is no function to adjust intake water amount at the intake mouth.</td> </tr> <tr> <td data-bbox="119 1086 199 1288">(5)</td> <td data-bbox="199 1086 774 1288">           - Flood flows directly into the irrigation canal.            - There is a lot of sediment inflow into the irrigation canal.            - There is no sand settling function for the extracted water, and there is a lot of sediment accumulation in the main irrigation canal.         </td> </tr> </table>	(1)	- There is concern about possibility of washout or destruction of the weir itself.	(2)	- It is difficult to secure the water intake level because the weir body is broken due to riverbed decline by scouring.	(3)	- River water route moves due to opposite side bank scouring, and the water cannot flow into the intake mouth.	(4)	- There is no function to adjust intake water amount at the intake mouth.	(5)	- Flood flows directly into the irrigation canal. - There is a lot of sediment inflow into the irrigation canal. - There is no sand settling function for the extracted water, and there is a lot of sediment accumulation in the main irrigation canal.	<p><b>Countermeasure</b></p> <table border="1" data-bbox="815 705 1469 1288"> <tr> <td data-bbox="815 705 895 817">(1)</td> <td data-bbox="895 705 1469 817">           - Flood diversion channel is secured by dividing the river channel by sand bar.            - Curved full-width weir reduces unit width overflow discharge.         </td> </tr> <tr> <td data-bbox="815 817 895 929">(2)</td> <td data-bbox="895 817 1469 929">- The entire width and gentle gradient of weir body from the riverbank to the sandbar prevents scouring at the immediate downstream tip of the weir and secures the intake water level.</td> </tr> <tr> <td data-bbox="815 929 895 1041">(3)</td> <td data-bbox="895 929 1469 1041">- Water flows from two directions of the curved weir are collected in the center downstream of the weir to offset the flow energy and prevent scouring on the opposite side bank.</td> </tr> <tr> <td data-bbox="815 1041 895 1086">(4)</td> <td data-bbox="895 1041 1469 1086">- The intake water amount can be adjusted manually with the double flush board method.</td> </tr> <tr> <td data-bbox="815 1086 895 1288">(5)</td> <td data-bbox="895 1086 1469 1288">           - Flush board method prevents flood flow from flowing into the irrigation canal.            - Extracting overflowed water above the flush board can prevent the inflow of sediment to the main irrigation canal.            - Sediment inflow and deposition in the main irrigation canal can be prevented by providing a sand flushing ditch and a sand basin.         </td> </tr> </table>	(1)	- Flood diversion channel is secured by dividing the river channel by sand bar. - Curved full-width weir reduces unit width overflow discharge.	(2)	- The entire width and gentle gradient of weir body from the riverbank to the sandbar prevents scouring at the immediate downstream tip of the weir and secures the intake water level.	(3)	- Water flows from two directions of the curved weir are collected in the center downstream of the weir to offset the flow energy and prevent scouring on the opposite side bank.	(4)	- The intake water amount can be adjusted manually with the double flush board method.	(5)	- Flush board method prevents flood flow from flowing into the irrigation canal. - Extracting overflowed water above the flush board can prevent the inflow of sediment to the main irrigation canal. - Sediment inflow and deposition in the main irrigation canal can be prevented by providing a sand flushing ditch and a sand basin.
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## How Should PMS Method Irrigation Facilities Be Constructed?

In the planning, design and construction of PMS method irrigation facilities, an advisory team familiar with the project should be appointed until the essence of the PMS method irrigation projects shown in the guideline is widely disseminated. In the construction of PMS method irrigation facilities, quality control, safety and security measures should be taken, and the capacity building to beneficiary farmers who will be responsible for the operation and maintenance of the facilities should be fully delivered after the construction is completed.

- Boulders shall be stockpiled in case of an emergency. In areas where there are no large boulders, some considerations such as using cobble stones as a filling material for pilings of gabion shall be required.
- It is necessary to carefully check whether the embedded parts, etc. that disappears after construction is constructed as designed.
- Security measures shall be taken in collaboration with local autonomous organizations and neighboring chieftains. In addition, consensus building shall be achieved with those who may suffer disadvantages from the construction work and sufficient compensation shall be provided.
- Capacity building related to basic civil engineering techniques for beneficiary farmers responsible for facility operation and maintenance shall be sufficiently carried out through on-the-job training during the construction period.



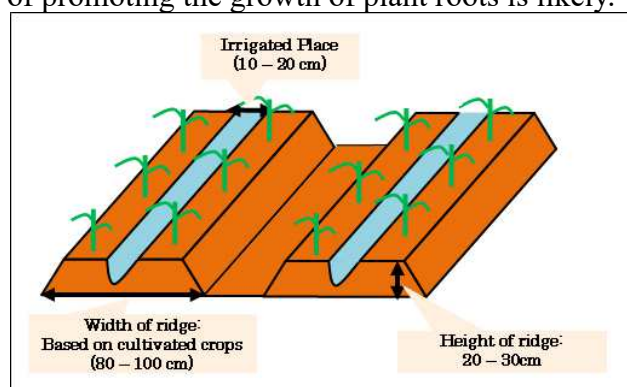
## How Should Operation and Maintenance of PMS Method Irrigation Facilities be Implemented?

Beneficiary farmers must take the initiative in operating and maintaining PMS method irrigation facilities. In principle, the cost burden to water users must be borne by the beneficiaries to maintain the sustainable functions of the facilities. Each community has various traditional or administrative water governance systems. It is necessary to decide about the operation / maintenance entity of the facility, based on the current situation. On the other hand, the project implementation entities/persons need to be continuously involved in the maintenance of the facilities, ensuring a budget for large-scale repairs and restoration when needed, and are required to respect the will of the local community and beneficiary farmers. In the operation and maintenance of PMS method irrigation facilities, WUA or IA (water users' association or irrigation association) by beneficiary farmers, *Mirab* (water manager) and project implementation entities/persons / government generally each have their respective roles. It is necessary to clarify, formulate and implement a sustainable operation and maintenance plan.

Operation and Maintenance Work	WUA/IA and Beneficiary Farmers	<i>Mirab</i> (water manager)	Project implementation entities/persons, Government
<b>Operation of Irrigation Facilities - Intake Gate Operation and Water Distribution (Water Users' Expense)</b>			
Preparation of a water allocation plan	<ul style="list-style-type: none"> <li>Proactively implement based on consensus building</li> </ul>	<ul style="list-style-type: none"> <li>Implementation of operations and observations, etc.</li> </ul>	<ul style="list-style-type: none"> <li>support</li> </ul>
Intake gate operation and equal water distribution			
Measuring and monitoring water level and intake amount			
Response to extreme situations			
<b>Maintenance of Irrigation Facilities (Water Users' Expense)</b>			
Preparation of maintenance plan	<ul style="list-style-type: none"> <li>Proactively implement based on consensus building</li> </ul>	<ul style="list-style-type: none"> <li>Routine inspection</li> </ul>	<ul style="list-style-type: none"> <li>support</li> </ul>
Irrigation facilities <ul style="list-style-type: none"> <li>Daily maintenance and regular simple repairs</li> </ul>			
Rivers <ul style="list-style-type: none"> <li>Understanding rivers and sandbars situation</li> </ul>			
<b>Large-Scale Repair of Irrigation Facilities (Project implementation entities/persons' or Government's Expense)</b>			
Irrigation facilities <ul style="list-style-type: none"> <li>Repair of gabion at joint of the weir</li> <li>Repair of the main body of the weir and erosion at the downstream, etc.</li> <li>Repair of dikes and revetment work</li> </ul>	<ul style="list-style-type: none"> <li>Participation in repair work</li> </ul>		<ul style="list-style-type: none"> <li>Ensure a budget and carry out large-scale facility repairs and river construction.</li> <li>Implement as a new PMS method irrigation project when restoration is required.</li> </ul>
Rivers <ul style="list-style-type: none"> <li>Sandbar protection</li> <li>Riverbank protection</li> <li>Excavation / dredging for ensuring division of river channel</li> </ul>			

## How to Improve Crop Cultivation Technologies?

Based on the experience and knowledge in the existing PMS irrigation project area, the field water management technology, cultivation technology and soil improvement technology are all introduced as useful technologies for improving the crop cultivation. In particular, the new method of irrigation on ridges in which the ridge width is set wide and water is supplied to the center of the ridge is highly effective in saving water because it directs irrigation water only near the roots of plants. In addition, since the ridges are irrigated, drainage conditions are improved. and the effect of promoting the growth of plant roots is likely.



**Irrigation on Ridges**

PMS method irrigation facilities are important facilities which are protected and improved by the local community. It is important that the local community cooperates in regular maintenance, to enhance the ownership of the local community. Just as Dr. Tetsu Nakamura has devised by trial and error in the Kunar River basin, it is desirable to create and continuously develop irrigation facilities most suitable for own homelands with our own hands.