IMPLEMENTATION OF PARTICIPATORY IRRIGATION MANAGEMENT AND ITS ROLE IN IMPROVING THE CEREAL WATER PRODUCTIVITY – A CASE STUDY

Reza Taghdisi Haydarian[1], Soheila Pour ResaneManesh[2]

ABSTRACT

Active participation of farmers in operation and maintenance of irrigation and drainage networks plays an important role in improving irrigation management and sustainable agricultural production. In this regard, the project of establishing the participatory Irrigation management system in the Gareh Sou- Zarringol irrigation and drainage network in Gharebolag village in Golestan province of Iran was started in early 2017. The client of project was the regional water company of Golestan. The meta-facilitation technique based on fact-finding inquiries was used to engage the farmers. In order to implement the participatory irrigation management (PIM), measures have been taken with central role of water users association (WUA) and with the support of governmental and local organization. These actions consist of three parts: 1- Extension training on agriculture and irrigation practices 2- Regulating the system of operation 3-Empowering the existing organization (Lale kesht production cooperative). The result of the project and active participation of farmers in the participatory irrigation management was the increase in water productivity of wheat from an average of about 0.98 kg per 1 cubic meter of water to about 1.15 kg/m3 per year.

Keywords: Participatory irrigation management, Meta-facilitation technique, Water productivity

1. INTRODUCTION

The project siteforestablishment of the PIM in the irrigation and drainage Network of GhareSou – ZarrinGol (development Unit of Ghare Bolagh), is located in Golestan province and in Ali Abad city. The area of Ghare Bolagh irrigation Network is 2300 hectares. This network is a surface irrigation (open channels). This is located 10 Km far from Ali Abad - e –Katoul toward Ghare Bolagh village. Figure 1 shows the map of the place and the location of the study area.

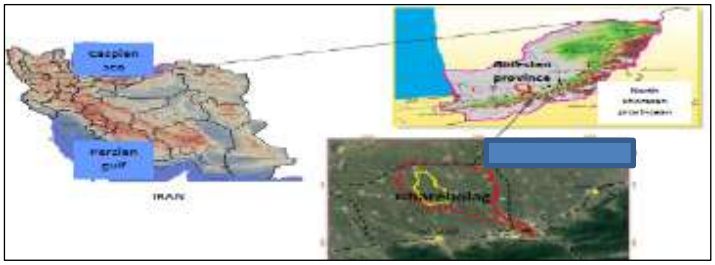

Figure 1 Map of the study area (Ghare Bolagh in the IRAN)

2. Establishment of participatory Irrigation management in the region

1 Project Manager of establishing the PIM system in the GarehSou- Zarringol irrigation and drainage network, Toossab Consulting Engineers Company, Mashhad, IRAN

2 Head of Irrigation&Drainage Group ,Toossab Consulting Engineers Company, Mashhad, IRAN

Establishment of PIM in the irrigation and drainage Network of Ghare Sou – ZarrinGol was carried out in 2 steps. First step included the participatory planning and doing the pattern executive preliminaries. Itincluded the establishment of project leadership council and province work group , establishment of county work group, training of provincial and county work groups , selecting the executive person in charge of the project , providing basic and fundamental data and information about the study area including its meteorology , Resources and costs etc. ……, recognition of beneficiary groups and performing participatory workshops to analyzing and problems and difficulties explanation in the direction of purposes and the scopes of the plan. Second step included the fixing of the deficiencies and complication of the essential and basic data and information, providing an executive for project operation (PO) the technologies and principles of easing and facilitating, providing an action plan (AP) and carrying out operational plans.

In these studies, fact-finding inquiries has been used in the frame work of Meta-facilitation technique. In order to promote thewater management based on public participation, throughthis project the implementation of the original version of participatory water management pattern was measured. So that and in the direction of establishment of the participatory Irrigation management in the region the Project Cycle Management (PCM) method has been used and by defining and coding a logical framework and pattern or project Design Matrix(PDM) and Plan of Operation (PO) the procedure of project performance is always managed.

The prospect of the establishment of participatory water management in the irrigation and drainage network of Ghare Sou – ZarrinGol is Lale Kesht Production Cooperative of Ghare Bolagh village.

With the commissioning of the project measure was taken for providing an office for reactivating of this cooperative company in the region of Ghare Bolagh village. After required verifications, the election of new members of the management board wa carried out and new management board was established. Then in order to implementation of participatory Irrigation management, social system and organization strengthening, agriculture and irrigation professional working groups were established in the Toossab consultant engineering company and the election of local facilitators was done. After word with the cooperation of each of professional working groups including local experts and farmers under mentioned measures in the direction of participatory water management in the region of Ghare Bolagh village were taken as follows.

2.1 Agriculture Working Group

In Agriculture Working Group the main activities for establishment of the participatory water management are, providing identification document for agricultural land pieces by farmers participation, attending farming workshops in the location of village or farm, carry out of soil tests and fertilizers recommendations, performing demonstrative farms , and Sampling of the crops yield.

2.2 Organization Empowerment And Operation System Working Group

In this Working Group, the main activities are concentrated on the introduction of Ghare Bolagh LaleKesht cooperative company and the establishment of discipline in the place of the office, discussion of the participatory water management project for Ghare Bolagh Lale Kesht cooperative members, identification of stakeholders and mutual communication with them, holding training courses on how to establis a participatory water management system, formation of the Water User Groups, and establishment of water management Unit.


2.3 Irrigation Working Group

In the irrigation working group, the main activities include organizing and holding the training courses for farmers on water saving oriented irrigation, selection of land area for irrigation pilot plan, defining the irrigation program by participation of farmers, improvement of irrigation methods (converting area based irrigation to time intervals or hourly irrigation method based on the consideration of texture or combination of the soil, slope of the lands, crops, experiences of the irrigation in the region), providing and executing maintenance and operation plan of the network .

3. WATER PRODUCTIVITY OF WHEAT BEFORE THE ESTABLISHMENT OF WATER PARTICIPATORY SYSTEM:

Water productivity is defined as the ratio of agricultural output to the volume of water consumed by crop.

To calculate Water Productivity, the ratio of dry matter to consumed water was used. Water productivity is expressed in different ways, in this study, grams and kilograms of dry matter per cubic meter of water have been used.

In the first year, before implementing a participatory water management system in the region, the following measures have been taken to estimate the water productivity of wheat.

A) Measuring the Average yield of wheat

In order to estimate the yield of wheat the scaled measuring has been carried out in 150 block of the farms of the region with an area of 1000 hectares. Scaled measuring plan was carried out in 3 orientations including measuring preliminaries, selecting the block of the farms for measurement, and providing the required devices and tools. Due to the time table, the scaled measuring activity (sampling – drying, threshing and weighing) after holding some consecutive and successive meetings and expert visit from the farms started in late June and lasted for a month.

For this purpose a 1x1 timber frame completely random sampling in the selected farms has been used which in each land piece , samples were taken from 4 points and the samples after taking were transported to store for drying and threshing . The average yield of wheat with regard to 150 sample taking land pieces has been measured around 3600 Kg per hectare.

B) Measurement of Consumed Water Rate

Consumed water rate has been calculated based on water withdrawal from Negarestan dam and the area of irrigated lands. Also the volume of irrigating water has been measured by using parshall flume within the farm. It's needed

Consumed water rate measurement by using Parshall flume

to be discussed that due to the precipitation rate in the region, the irrigating of cereal is done just for one time.

C) Effective Rainfall

Based on the obtained precipitation statistics from Bahlakeh meteorology station located 4 Km s off the plan site, total precipitation rate since October,2016 till May, 2017 is equal to 321 mm. Due to the starting date of wheat planting in the region, effective rainfall was calculated since December, 2016 till May, 2017 by using of FAO Organization method (Publication 24). Table F.A.O-24 has been presented in the following.

Effective rainfall values have been estimated based on the recommendation of F.A.O. using the average monthly rainfall and evapotranspiration of the considering crop (ETC).

Effective rainfall based on the F.A.O proposal is estimated using the average monthly rainfall and evapotranspiration of the desired product.

Average monthly effective rainfall in mm	12.5	25	37.5	50	62.5	75	87.5	100	113	125	138	150	163	175	188	200
ETC monthly	Average monthly effective rainfall in mm															
25	8	16	24													
50	8	17	25	32	39	46										
75	9	18	27	34	41	48	56	62	69							
100	9	19	28	35	43	52	59	66	73	80	87	94	100			
125	10	20	30	37	46	54	62	70	76	85	92	98	107	116	120	
150	10	21	31	39	49	57	66	74	81	89	97	104	112	119	127	133
175	11	23	32	42	52	61	69	78	86	95	103	111	118	126	134	141
200	11	24	33	44	54	64	73	82	91	100	109	117	125	134	142	150
225	12	25	35	47	57	68	78	87	96	106	115	124	132	141	150	159
250	13	25	38	50	61	72	84	92	102	112	121	132	140	150	158	167

Reference Table # 37, F.A.O. – publication No. 24

Table Precipitation Rate and Effective Rainfall of Bahlakeh Station 2016 - 2017

Month	crop Year2016- 2017	
	Precipitation (mm)	Effective Rainfall (mm), FAO Method (Based on Average Precipitation and (ETC) Values
Nov. – Dec.	44.5	28
Dec. – Jan.	9.5	8
Jan. – Feb.	77.5	46
Feb. – Mar.	25	17
Mar. – Apr.	44.5	31
Apr. – May.	32	24
Total	233	154

D) Water productivity Rate

Due to the yield of wheat results and water productivity rate and effective rainfall, the water productivity has been calculated and its results have been presented in the following table.

Due to the result of the said table water productivity in the whole region is estimated around 0.98 Kg per one cubic meter of consumed water which has been set in the state average values.

Table -Water productivity Rate in the whole of wheat farms – Agricultural Year of 2016 – 2017

Measuring Year	Average yield (wheat) (Kg/ha)	Consumed Water per Hectare(m^3/ha)	Effective Rainfall (m^3/ha)	Water productivity (Kg/m^3)
2016-2017	3600	2000	1540	0.98

3.1 Water Productivity After The Establishment Of Participatory Water Management System (Scaled Measuring In Agricultural Year Of 2017 – 2018):

After the establishment of participatory water management system within the Ghare Bolagh network and taking the measures in planting, irrigation and operation system and supporting of the organization as mentioned earlier, measuring of water productivity in Ghare Bolagh network was carried out. The results of this investigation have been presented as following tables.

It's needed to be discussed that in first year according to the local common trend, irrigation of the lands has been carried out regardless of water needs in the form of the area in hectares which this matter has caused more water consumption.

In the second year and after investigations and coordination of the farmers of the region, lands irrigation was carried out in the form of time (in hours) distribution of water, which this matter has been resulted in less water consumption and water savings.

As it is noticeable water productivity rate has been reached to about 1.15 Kg of the product against one cubic meter of consumed water, which has been increased to

17%. Considering that participatory management plans are a continuous and gradual development system, therefore for the first year of plan execution, this amount of progress and development is evaluating acceptable.

Table – Precipitation rate and effective Rainfall of Bhalakeh station 2017 – 2018

Month	crop Year 2017-2018	
	Precipitation (mm)	Effective Rainfall (mm), FAO Method (Based on Average Precipitation and (ETC) Values
Nov. – Dec.	90	52
Dec. – Jan.	61.5	37
Jan. – Feb.	65	39
Feb. – Mar.	23.5	16
Mar. – Apr.	35.5	25
Apr. – May.	33.5	24
Total	309	193

7

Measuring Year	Average Yield (wheat) (Kg/ha)	Consumed Water Rate per Hectare(m^3/ha)	Effective Rainfall (m^3/ha)	Water productivity (Kg/m^3)
2017-2018	4200	1723	1930	1.15

4. Conclusion

Establishment of participatory water management system in the irrigation and drainage networks with active participation of farmers and relative administrations and organizations in operating and maintenance of network can result in optimum usage of water, soil, and public infrastructures. Involving the farmers in operation and maintenance of irrigation and drainage networks along with their training increases agricultural production and can bring food security.

5. REFERENCES

Participatory Water management system establishment in Golestan province

Term of cooperation: Jan. 2009, to Jan. 2014

Project site or location: Tazeh Abad zone (operational district of Payvand rural production cooperative)

Executive organization: Agriculture-Jahad organization of Golestan province, Japan International Cooperation Agency (JICA),

ZarrinGol– GhareSou irrigation and drainage network reports: Pazhouhab consultant engineering – 2011

World experiences in regard with participatory irrigation management and irrigation management transference (excerpt essays of the said international participatory irrigation management seminar- Iranian National Committee on Irrigation and Drainage (Sep. , 2010)

Present project Experiences