ARTIFICIAL RECHARGE OF UNDER GROUNDWATER RESOURCES RESULTED FROM PERFORMING WATER SPREADING PROJECTS (CASE STUDY: KHORASSAN-KASHMAR)

Bahram Mahammasdi Golrang[1]
Mojgan Mashayekhi[2]

ABSTRACT

Man has always faced different water problems in different ways.while in Iran and other parts of the word we face drought and water shortages, there are certain places around the world where flooding is the main problem. However, there are certain regions in the world, like Iran, which usually face with two problems, drought and flooding simultaneously. Environment protection and scientific organizations search for the optimal use of environmental resources including soil, water and resources including soil, water and plants which should be in balance with each other. The role of rainwater catchments systems is more sensitive in its nature which involves the conservation of water, soil and grown water supply. It is due to this fact that we should keep man's three important environmental resources including water, soil and the plants in harmony. Safeguarding their optimal and continuous utilization, the floodwater spreading systems are among the most efficient rainwater catchments systems. These systems, in comparison with other systems for floodwater harnessing are considered the most efficient. Their implementation is not only much more economical but they also provide us with new possibilities for crop production. The most important feature of these systems is that they will provide the land for creation of pastures and artificial forests in arid lands and deserts.

Key word: Aquifers – Soil – Erosion- Artificial recharge- Groundwater

INTRODUCTION:

Using and controlling the floodwater in many parts of the world have been traditionally developed in many parts of the world specially. These parts in which the amount of percioitation is not enough for agriculture. it goes back to more them 3400 year B.C .

1- (Member of scientific academy of Khorassan agriculture and natural research center)
Mashhad- P. O. Box: 488, Tel:09155130255, Email: b_golrang@yahoo.com
2- (A Research expert of Payam-e-noor university in Mashhad)
Mashhad-Abo-Bargh-Hafte tir St. No: 22, Email: Mashayekhi_Mojgan@yahoo.com

The method of using floodwater, depending on different circumstances differ from each other one of the most important methods, having several goals, in the water spreading method. This is the best and the native knowledge and modern together.

The artificial recharge is one of the best method for improving underground water resources and Qanats. The goal of this research is to evaluate the effect of such projects on the condition of underground resources in Kashmar.

Aquifer management (AM) is a variation on the same theme: “where possible, recharge the empty aquifers in wet years and optimize the water use for sustainable production and development “.

AM is defined as the science and art of maximizing the productivity of aquifers by whatever reasonable means, and optimizing all of the resources which somehow bear upon the continused usefulness of aquifers. Therefore, any activity on the basins of aquifers, on the debris cones, and wherever artificial recharge of groundwater (ARG) is performed, the means and reates by which water is extracted from the aquifers, and the way the water is used downstream, has to be performed in such a manner that the continued operation of the aquifers is ensured .

Water is the most important factor for life.Food chain and social-economical activities is related to it.Water distribution between oceans and dry lands is related to hydrological circle.(Mutiso,2003).water shortage population growth in arid and semiarid region is caused some problems.Ground water is an important for water supply because of limitations in surface water use.Improper recharge of aquifer effected ground water table and downing it.One of suitable method in artificial recharge is use of seasonal flow.History of ground water recharge is more than one thousand years(jakel&Heinzman,2003). Natural and artifical recharge is two main methods in aquifer recharge. Rainfall is the main source of natural recharge and all aquifers are affected by it. But in artificial recharge,water is infiltrate to a impervious formation(Heydapoor,1990).this method is based on structural work and ground water table is increasing,so it requires precious design and programming. The main advantages of recharge are:prevention of water wasting,improvement of ground water quality,restore origin aquifer conditions Alter ground water flow direction in order to prevention of pollution resources,cost minimizaing in relation to surface storage reservoir,eliminate evaporation losses in surface water reservoir and decreasing of pollution risk in surface reservoir (majead,2000).A research in dry soil of oman is showed that efficient of aquifer recharge is increasing with soil moisture content,water level of surface water and time of infiltration (Gerhard & frana,2002).

Aquifer recharge is releted to river canal in dry land and depend on direct recharge with rainfall or in filtration through cracks.(kearns and Hendrickx,1998)In surface recharge infiltration and percolation factors is very important,1998)In surface recharge infiltration and percolation factors is very important.physical and chemical characteristics of ground water is a adapting with aquifer characteristics over the time.Topography conditions,surface soil type,General slope,land volume and kind of water are affected in type and amount of recharge (Attarzadeh,1974).Also for evaluation of aquifer recharge,simulation models of ground water such as MODFLOW can be used (Thomas,2003).

Ground water dam is a suitable rechnique for water supply,prevention of water wasting and artificial recharge of ground water.Ground water dams may by of two types.sub-surface dams and sand storage dams.The main method for construction sub-surface dam is in an excavated trench in a valley or river bed.

Dam with can be decreasing with use of construction works and decreasing cost.Generally ground water dam constructed in the end of the dry season,because of low flow in these periods and can be pumped to out.These dams hare multiple use.For example for prevent of sea water percolation in ground water,after several evalution,are used of a subsurface dam in an island which located in northern of Okinawa in japan (jinno and et al,221).Several sand storage dama constructed in kenya;216 dams constructed in the rivers of the kitui region that covered 600 km area unit April 2001 .These dams are affected local communication .For example,a sand storage dam is constructed in kiindu river basin in 1998 . Groundwater level before of construction is 12 feet that reaxhed to 4 feet after constructed,while were affected by drought.Also capability of all dam were not good(Hoogduin and etal,2004).

SAND STORAGE DAMS:

A sand storage dam impounds water in sediment caused to accumulate by the dam itself.Filled pond with sand is General kind of infiltration equipments.Sand layer do mechanical and chemical treatment.Particles accumulation can be decreasing infiltration and some problems appear (Heydarpool,1990).Usually the height of sand storage dam is among 1 to 4 meter(Nillson,1988).In the following suitable ohysical conditions and appropriate critetia for site selection and construction of sand storage dams have evaluated.

MATERIALS AND METHODS:

Water shortage and its resulting problems, is the matter which has the direct relationship with man’s environment and iss wise element-man. Intensifying of the problems caused by water shortage, drought and floods together with the increase of population and expansion of urbon areas have been the real reasons to carry out a multi-purpose effort, all around the word to find practical alternatives in this relation. Infact, these continues effort and the modern innovations and up to date knowledge and techniques to surmount the problems resulting from water shortage and optimization necessity of the existing water resources, show the improved path of ways and methods which have been common in different places or some of them have been forgotten, gradually . with passing of time and increase of population along with increase of food and water demands the thought to making use of floodwater in high volumes where controlled was not possible by simple methods and small measures . Man in search of water by benefiting of experiences of floodwater farming gained access to flood spreading techniques .collection and transfer of significant volumes of flood waters and spreading them in low-sloped farms which have high penetration and suitable water passage coefficient is necessary for this method .

In this method, the goal is not limited to making optimum use of water but in addition to supplying water for farming or conservation of rangelands and establishment of tree

cultivated lands is amendment of farms by spreading small suspended grains in flood waters and artificial recharge of groundwater are of the important objectives.

For this reason to make use of this method usually the existence of conponds and larg grain alluvium plains which have the necessary ability to store water and make use of it in drought periods by well excavation is provided .these are of the major points which should be considered . this method which is called ground water artificial recharge in iran in regions where the watershed areas due to various reasons have the ability of producing surface runoff water in larg volumes and the climatic conditions make possible the plant coverings in short term and in some case in long term (due to insignificant reason the annual rainfall and its unsuitable distribution) can be used as an efficient method .results gained from this study shows that Iranians throughout history and in different conditions have used this method in some way for different objectives .today in different regions, this method is used in various ways . The most common are as follows:

- Deep water method in pieces of land surrounded by sand walls having excess water overflow for each piece.
- Spreading of water in singular canals known as meskats .
- Spreading of water in wide canals with high sand dunes at the water foot know as liman.
- Floodwater spreading in leveled terraces on coneponds and alluvium plains known as oases.
- Produced floodwater spreading from unproductive farms in constructed leveled terraces on plains.
- Floodwater spreading in coneponds and large grain alluvium with construction of floodwater spreading canals by using sand dunes construction in the sections without water.

Of the methods mentioned, floodwaters spreading on coneponds and alluvium plains are more common than other methods.

Results:

Floodwater spreading is the best method and will have maximum multipurpose usage of floodwaters including:

1. Economic control floodwater, reduction of its damages and proper management.
2. Proper and low cost recharge of aquifer for optimum precipitation utility.
3. Amendment of unutilized coarse alluvial basins to ranglands and forests.
4. Amendment of bare and desert lands to new cultivated lands.
5. Prevention of sand moving by depositing of adhesive fine sediment and improvement vegetation cover.
6. Rehabilitation of bare lands and prevention of desert incursion.
7. Making occupation.

8. Increasing of agricultural products and improvement of natural resources economy.
9. Optimization of environment and development of reclamated forests and ranglands .
10. A planned and strong movement against weather altrations and drying climate.

PHYSICAL CONDITIONS FOR CONSTRUCTION OF SAND STORAGE DAMS:

1- CLIMTE

The need to dam groundwater for water supply purposes is caused basically by the irregularity of rainfall would generally be sufficient to cater to the needs of people and agriculture,but here the seasonality means that during some parts of the year water is not available.

2- TOPOGRAPHY

The topographical condition governs to a large extent the technical possibilities of constructing the dam as well as achieving sufficiently large storage reservoirs with suitable recharge conditions and low seepage losses.

3-HYDROGEOLOGY

Suitable aquifers for construction of subsurface dams are riverbeds made up of sand or gravel.In –situ-weathered layers and deeper alluvial aquifers have also been demand with success.The specific yield of such water-bearing strata may vary from 5 to 50 percent depending on grain-size distribution,particle size and compaction.Hydraulic conductivity values are more sensitive to the type of material constituting the aquifer.

4- SEDIMENT

The accumulation of sediments upstream of a sand-storage dam is the find result of a series of physical processes,which will all influence the hydraulic characteristics of the sediments.The parent roch in the catchments is the basis weathering orocesses disintegrate the roch and soil particles.Are detached by erosion,transported by water and finally deposited in the storage reservoir.

Hydrological and hydraulic aspects of sedimentation directly are relevant to the storage of water in sand-storage dams.

5-WATER FLOW

The surface flow of water in the stream under consideration will determine the design of the dam in terms of stability and height,as well as govern the sedimentation process in

the reservoir.An analysis of surface discharge data in the actual river or similar rivers in the same area would make it possible to arrive at design flows.

6-BEDROCH FOUNDATION

Ground water dams should as far as possible is anchored in solid roch.This generally gives the best stability and it makes it possible in most cases to control seepage below the dam.

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8. Increasing of agricultural products and improvement of natural resources economy.
9. Optimization of environment and development of reclamated forests and ranglands .
10. A planned and strong movement against weather altrations and drying climate.
11. Actualization of public participation in various aspects for development, reclamation and conservation of natural resources.
12. Making serious belief about socio-economic development on the basis of agriculture.
13. Revival of sustainable agriculture development and non-oil economy in the way of Islamic revolution ideals. These are also the explicit desire of the great leader of Islamic revolution, the agendum of government and Iranian Moslems wish.

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Photo 1: Planting of trees in floodwater spreading areas

Photo 2: floodwater spreading for artificial recharge of groundwater

Photo 3: soil erosion and runoff control by floodwater spreading project in Kashmar

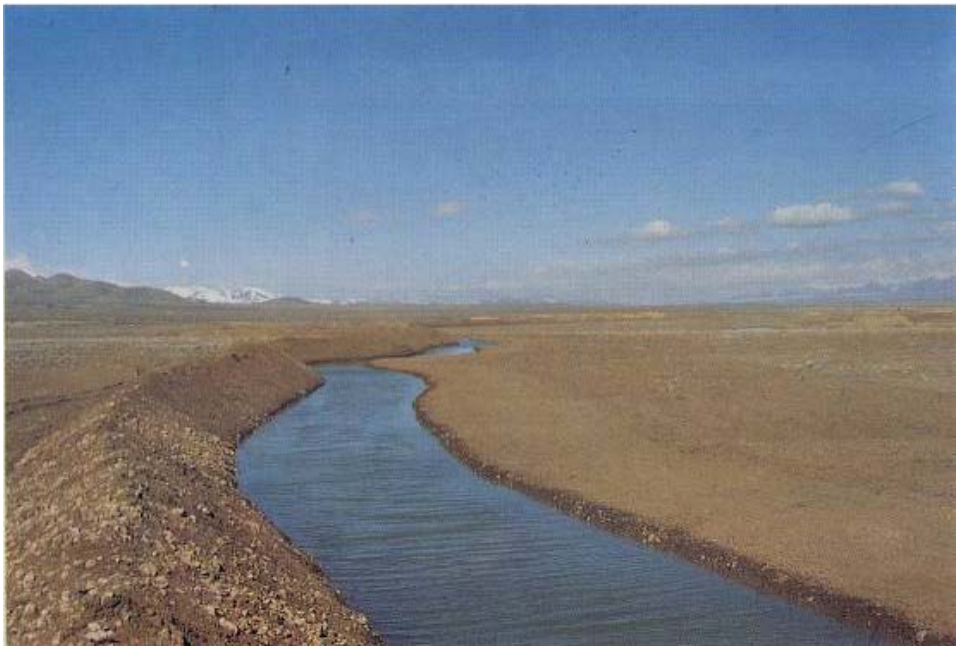

Photo 4: floodwater spreading on aquifers project.