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Management of water agriculture regarding to profit index (Case study: Mashhad - Chenaran weald in Iran)

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ABSTRACT: The aim of the present study reviews the efficiency of agricultural water for crops is located in Mashhad, chenaran plain, Khorasan Razavi province. In this study, the required information through the provincial Agricultural Organization as well as farmers and experts of the study area, water is collected and analyzed. For analysis and the analysis of information obtained from three CPD, BPD, and NBPD. The results of this study indicate that the high water consumption with the cultivation and the economic efficiency of the bottom like barley and sugar beet cultivation pattern of range of removal and instead cultivate that reduces water extraction and increase the economic benefits for farmers are the same as canola and wheat as well as potato substitute. As well as the need to pay attention to the nutrition of the aquifer by means of seasonal floods that by choosing the correct method and location can be very useful indeed, and the use of low-consumption or irrigation systems and water saving methods or reduce contingent cultivation to raise production per unit area is also essential to appear.
Key words: water efficiency, water management, drought, aquifer, chenaran, Mashhad plain

INTRODUCTION

The significant problems of environment in the Middle East are crisis and lack of water. Many of experts believe that using from water sources in Iran will be caused serious problems in future because of not considering commen limitation. The space among renewal rate and interest rate from Abkhan had increased regarding to agriculture and industry activities development. And this space has been increased because continual drought so that experts point to management on logical full usage of water sources of Abkhan especially at full usage and less output sectors. many areas of country such as dried regions in the beginning of developmental evolutions , has encountered to the considerable stagnancy of environmental natural sources such as access to the sufficient and permanent water sources , so that there is an opportunity for developing these areas which are effected at the progress of country (Jaffar Javan and Fall Soleiman,2008).

The Khorasan Razavi province is the one of dried region of the country that there is atmosphere rain because of few portion superficial water , and the most of using water in agriculture sector and other different rectors are by obtaining water from Abkhan wealds. According to commend statistics from 36 wealds at the province, 33 wealds are crisis and forbidden.

The share of water underground from renewal water sources is 6 billion cubic meter. While the utilization rate from water underground is 6.7 billion cubic meter. This means that water level from underground sources of the province is negative.

The experts believe that the important reason of subsiding fields is irregular withdraw from water underground sources by illegal wells and addition withdraw from allowable wells and water sources restriction, and drought periods continuity.

In the basis of results from analysis of recorded information at Toos station in 15 kilometres the west of Mashhad, Mashhad weald has subsided 8 cm from 1994 to 2006.

The technology growth and inventing new utilization things in the form of deep wells and semi- deep from 50 years ago, cause that a lot of digging the deep and semi deep wells at wealds of province are founded. Although the official statistics had been shown that 700 million cubic meters is over taking water from wealds of province, many experts believe that missing of wealds warehouse is more than this annual rate about one billion cubic meters.

This issue is become severe when subsidence wealds happen because of becoming dry alluvium layer of these regions and the death wealds will begin by destroying the chance of nourishing wealds.

Regarding to subsidence wealds, it lasts thousands years that water underground warehouse become full. So irreparable damages have been involved these sources by irregular taking. Experts believe that the main factor of subsidence wealds is the irregular taking water from underground sources that the taking water of underground sources must be controlled quickly.

In view of the fact that the consumption of agriculture sector is about 95 percent of water obtaining sum from Abkhan of province.

So adopting strict administrations to limit and reform the water usage pattern in this sector which can be effective for reducing utilization rate and compensation Abkhan missing, and finally reducing the space among utilization rate and renewal rate of Abkhan.

Research antecedent and theoretical foundations

Some studies had been done about different utilization issues that are referred below:

Bostani and Mhammadi (2007) stuied about water utilization and water demanding function in producing beetroot at Eghlid region. They said that utilization increasing which is treated as water increase handy can have clear influence on production.

Jaffar and Fal Soleiman (2008) found these results in the water crisis study and essential attention to water utilization agriculture at Birjand weald that lack of water and urging on saving Abkhan which are occurred because of droughts and expanding economic / social sectors necessities of dry regions of the country such as Khorasan Jonobi that encounters to serious crisis in the water provision.

It should be paid attention to different point of views of water management in the agriculture sector of these regions with economic environmental attitude priority, agriculture of water utilization indexes inside of other methods of water management in this sector.

Akbari, Mossavi and rezaei (2009) paid to agriculture of water utilization at drought regions in their study and the suitable farming pattern regarding water restriction of that region had been studied. They said that in the drought situation and lack of water sources, should cultivate crops which need a little water and they have high ability from economic viewpoint.

They have insisted on replacing less consumption crops that need few water sources and they are full of output from economic viewpoint.

Water sources condition, features of case study boundary

Because of non-existence essential information, we studied natural factors which are effective on Abkhan supplying just in a unit of area. So we decided to study only about dry dimensions and some issues that we have to do water optimization in agriculture at Mashhad – Chenaran wealds.

Then, in the based on the whole area recognition, we study just in one of the crisis sectors of the weald following by water utilization evaluating indexes in agriculture.

According to statistics of 2003, 3762 deep wells at Mashhad weald take water about 869 million cubic meters yearly.

Approximately 2200 semi deep wells also take water 18 million cubic meters yearly. So totally near 6000 wells take water 900 million cubic meters from Mashhad weald yearly.

By having 894 Qantas and 399 springs at highlands Mashhad weald is about 97 million cubic meters yearly.

In the based on total water underground offloading at Mashhad weald is one billion and seventy million cubic meter yearly that 103 million cubic meter is more than water which come into this weald every year.

Every year 967 million cubic meter water come into Mashhad weald by browses. Some rivers provide water underground of Mashhad weald such as Taragh , Karden , Esgil, and other several rivers which provide renewal volume of Abkhan Mashhad .

The level of water underground is low, often 10 percent of water that use for agriculture field irrigation, come back to Abkhan Mashhad weald.

103 million cubic meter over taking, certainly reduce the save volume of Abkhan. And it causes drop of water underground level of Mashhad weald, so that it has faced to 158 million cubic meter warehouse missing in 2004 – 2006. Also, the subsidence land, droughty, becoming dry wells, Qhanat , spring, reducing water underground quality , and becoming salty of water sources can be the effect of the drop of water underground level at the wealds.

And it takes 100000 years that Abkhan Mashhad weald forms again.

In this situation, if we do not stop over taking from allowable wells and taking from illegal wells, the big disaster will happen at Mashhad weald. In following table, some features of water underground of alluvium Abkhan are referred:

Table 1. water underground features of alluvium Abkhan in the case study restriction of Mashhad –Chenaran weald

The drop between the forecast years (90-80)	The drop between the years (82-60) meters	Fractional rate tank (million m3)	The total discharge rate (million m3)	Underground renewable capacity (million m3)
14.5	9.13	125	1075	950

Organization of Water Regional of Khorasan Province *

Lack of water and coming down level of useful water because of having weak management of the sources, not explaining correctly the lack of water issue, and non-existence of high viewpoint of consumer because of having weakness at circulating and training principles which cause to face a lot of problems in the country.

The farmers became disappointed because of having negative effects from non-utilization suitable from water sources, salient reduction, and the effect of these sources missing on income, product, profitable in agriculture sector.

Moreover, these problems make a lot of economic problems for them. Also, the economic country cannot develop.

METHOD OF RESEARCH

For determining utilization indexes of water agriculture, we need to measure expense and income of the main crops.

After total survey of issue dimensions, some of crops are chosen and they are checked.

Data have been prepared by agriculture ministry for costing the agriculture crops. And the data were analyzed.

Since using water in agriculture crops is important, in the other hand, being lack of accessible water sources at dry regions, people must use these rare sources correctly.

The importance of water utilization of agriculture for dry and droughty regions is increasing every day.

In addition above instances, it is important to protect and make capable the environmental sources which face to crisis in dry regions such as water sources, water utilization of agriculture from reducing water volume that decreases obtaining water from underground sources and water sources are firmed.

Frequently, water utilization of agriculture can be surveyed from different viewpoints such as output, financially, job chance.

From output viewpoint, is to produce many crops.

From financially viewpoint is the most profit. And from activity viewpoint, is to create more jobs for certain unit consumption of water volume. Attitude of water utilization of agriculture in dry regions which encounter to water crisis, it consists of two viewpoints: physically and financially.

It means that by obtaining the highest nut profit (from financially viewpoint); the lowest consumption water rate (from physically viewpoint), utilitarian achieve.

From this viewpoint, if the method and agricultural combination according to above conditions in dry regions are improved.

The best consumption from water sources can happen without destructive and critical effects, meantime increase of economic growth in agriculture sector (Javan, Fall Soleiman, 2008).

Water consumption utilization indexes of agriculture consist of CPD (crop per drop), BPD (benefit per drop), NBPD (net benefit per drop) in this survey.

CPD index calculates amount of producing crop relative to used water volume. Certainly if this relation is high, it shows the correct water consumption. While it cannot show the most economic benefit.

BPD index calculates gross profit relative to used water volume.

In this base, water consumption policy at used water unit should be increased. But in this method, expense of producing crop has not been considered. So, the best index for calculating water utilization is NBPD that not only determines the nut benefit relative to used water volume, but also this index is important in the method planning , planting combination in dry regions where are facing to severe water restriction.

By this way, the rare water sources can allocate to planting with which the lowest water consumption, give the highest profit to utilitarian. (Javan, Fall Soleiman, 2008)

CPD index shows that coming down the product function in front of used water rate causes unimportant relation producing crops relative to water consumption.

CPD = P / A

A = water volume consumed in HA irrespective of precipitation (m3)
P = the amount of product produced or amount of yield (kg/ha)

BPD index determines the gross value of producing any agricultural crops at the case region.

BPD = V / A

V = The amount of the total value of product sales (main and minor) HA (RLS)

NBPD index shows the nut benefit of every crop relative to water consumption rate that removes above defect.

NBPD = C / A

B = gross profit rate/ha (RLS)

THE RESULTS OF RESEARCH

For calculating of water utilization indexes of agriculture , at first , the expense of whole producing agricultural crops are put in four tables separately which consist of expense of period before planting , planting period , own period , harvest period that are in the base of relating indexes in below tables .

Table 2. the expense of producing agricultural crops at Mashhad – Chenaran restriction at Khorasan Razavi in 2008 – 2009

Row	Product	Before Implant	Implant	Maintenance	Collection	Earth	Total costs HA
1	Wheat	508720	989320	1916450	830660	667880	4913030
2	Joe	493180	829610	1477970	642530	595810	4039100
3	Rapeseed	708980	663300	3910380	657570	796760	6736990
4	Sugar beet	853780	3258640	5685630	4456280	330210	17556430
5	Potato	503160	6748140	3641280	2840030	825110	14557720

* Research findings based on agriculture statistics of Razavi Khorasan Province

The results of costing agricultural crops period have been shown in above table that totally the most expense of one hectare production of survey's crops belong to sugar beet and then potato , kalza ,wheat , grain marshal .

Costing these crops is mostly related to cost of costing crops periods are related to planting operations of potato, sugar beet, wheat, grain, and kalza marshal that the charge and cost of worker for irrigation were high.

Table 3. the gross value of crop at hectare of agricultural crops at Mashhad – Chenaran restriction in 2008 – 2009

Row	Product	The production of HA (kg)	Product unit price	The total value of the product/HA
1	Wheat	3695	3050	11269750
2	Joe	3400	2700	9180000
3	Rapeseed	1310	6200	8122000
4	Sugar beet	30800	620	19096000
5	Potato	25402	1080	27434160

* Research findings based on agriculture statistics of Razavi Khorasan Province

Above table shows the gross value of crop of any agricultural crops. Regarding data of tables 2, 3, and also transferring and explaining water at survey case restriction in 2009 – 2008 , in the base of table 4, water utilization indexes of agriculture are calculated by involving the range of water consumption for different crops , result of output in the below form:

Table 4. determining CPD, BPD, NPBD indexes in agricultural and estival crops by considering output of water transferring and explaining. (Agricultural year 2008 -2009)

Title	Product	Wheat	Joe	Rapeseed	Sugar beet	Potato
Water consumption in HA irrespective of precipitation (m3)		9856	10238	10256	25200	11603
Yield (kg/ha)		3695	3400	1310	30800	25402
Harkilogrm offers a sale price (RLS)		2050	2700	6200	620	1080
The cost per acre (RLS)		4913030	4039100	6736990	17556430	14557720
The total value of product sales (gross profit) (RLS)		11269750	9180000	8122000	19096000	27434160
Gross profit per acre		6356720	5140900	1385010	1539570	12876440
CPD (M3/kg)		0.037	0.033	0.12	1.22	2.18
BPD (M3/Rails)		114.3	89.66	791.4	757.7	2364
NBPD (M3/Rails)		64.4	50.2	135	61	110.9

* Research findings based on agriculture statistics of Razavi Khorasan Province

ANALYZING OF RESULTS

We are studying the results which exploit from table 4 for utilization indexes:

CPD index shows that being low of crop performance in front of water consumption rate causes that crops production becomes unimportant relative to water consumption.

So that by having 1000 liter irrigation water is about 1443 kilogram.

This digit for grain is 453 gram. Amount of CPD index about grain which has the highest level in Western European is between 1.71 to 4.45 kilogram. (Rahimi and Khaledi 2000)

These calculations represent that being the low level of agricultural production performance relative to used water rate, is one of reasons that water utilization is becoming low in this limitation.

Table 5. The preference of every studied crop on CPD index

index	Product	Wheat	Joe	Rapeseed	Sugar beet	Potato
CPD		4	5	3	2	1

BPD index has the highest productivity gross value for crops such as potato 2364 Rial , Kalza 791 Rial , beet 757 rial , wheat 114 Rial , grain 89 Rial marshal , but because of crops production expense will not be inserted in this index , it does not have more valid for econometrics .

Table 6. The preference of every studied crop on BPD index

index	Product	Wheat	Joe	Rapeseed	Sugar beet	Potato
BPD		4	5	2	3	1

NBPD index which shows the benefit of any crop relative to used water , removes the highest defect of index.

The survey of calculated results of the index shows the important wastage and valuable environmental source that by having 1000 liter water consumption will be obtained economic net value for potato 110 Rial , Kalza 135 Rial , wheat 64 Rial , sugar beet 61 Rial , grain 50 Rial marshal.

Table 7. The preference of every studied crop on NBPD index

index	Product	Wheat	Joe	Rapeseed	Sugar beet	Potato
NBPD		3	5	2	4	1

The results explains this point that although agricultural crops productions rate in lieu of water consumption unit (BPD) And the result of value added from water consumption (NBPD) are so low , by achieving data which can be effective in the reducing water consumption , and providing expected income for agricultural utilitarians in order to correction of planting pattern .

Also , these results emphasizes on this point that water which is important and basic environmental source in this region , it will face to droughty crisis and impressive reduction of Abkhan tank in feature .

It did not have suitable economic output in agriculture sector , and it needs new policies in based on environmental / economic remarks.

Offers

According to the results obtained for a fraction of the underground waters of the tank within the scope of the study will be offered as follows:

To prevent unauthorized operation of the well-studied

Avoid overdraft permitted wells (meters and power and the reduction of the series)

The reform of agricultural water in the fields, transmission system

Agricultural land leveling

Fed aquifer using seasonal floods

Low-irrigation (drip and sprinkler)

Modification of agricultural cropping pattern

Greenhouse cultivation and giving

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