Original Article: Investigating Possibility of Modifying Water Management Engineering

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ABSTRACT

Due to the pivotal position of water in country's development, governments are obliged to develop and reform the structure of water consumption, establishing a proper exploitation system. By using modern irrigation and low irrigation methods, irrigation efficiency will result in water efficiency per cubic meter during the program. The point that is of great importance in managing water resources and their consumption is to pay attention to the issue of drought, the crisis that our country has been grappling with for several years and exists in many parts of the country. Paying attention to global models for overcoming this crisis, planning for drought, and compensating for the damage caused by it can be a good help in this regard. Sustainable water management is an issue that the World Bank has put at the top of its agenda in natural resource management.

Introduction

Improving the irrigation method, collecting surface water, and storing it can be one of the methods to prevent water loss in agriculture. On the other hand, educating villagers and farmers with optimal irrigation methods using new irrigation methods, drip or sprinkler can also improve area's consumption method. Lack of knowledge and lack of training in agricultural water reduces water efficiency in this area show that it needs serious revision. In

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recent years, this issue has caused the villagers and farmers to leave the village, which is mainly due to drought. Even in this regard, many forests in the northern provinces, including Golestan province, have been severely damaged. This happens while in economic development programs. Improving the irrigation method, collecting surface water, and storing it can prevent water loss in agriculture.

Further, the law of equitable distribution of water emphasizes modern irrigation methods. This is appropriate with water extraction conditions from aquifers despite the negative level of rainfall in many parts of the country. The Ministry of Jihad Agriculture should also make serious efforts in this regard. The point that is important in managing water resources and their consumption is to pay attention to drought, the crisis that our country has been grappling with for many years and exists in many parts of the country. Paying attention to global models for overcoming this crisis, planning for drought, and compensating for the damage caused by it can be an excellent help to the government in this regard. Accessible water management is an issue that the World Bank has put at the forefront of its plans in natural resource management [9-15].

Drought planning and disaster management are well known. Although no technical expertise is needed to determine the timing of floods, volcanic eruptions, or earthquakes, it has been shown that there is considerable uncertainty about when droughts begin and end because drought is an unpredictable event. Still, as soon as you enter such an area, you can reduce the severity of the crisis or experience a smooth transition with a proper plan and provide a model to optimize water consumption and increase water productivity.

Water wastage in the agricultural sector is equal to 50% of the capacity of the largest dams in the country

There is a lot of waste in the production stage of agricultural products and subsequent stages, as only more than 30% of the number of agricultural products entering Tehran's city is discarded as waste. Meanwhile, education and promotion of topics related to this sector are critical and effective in reducing water consumption and waste in this sector because the age of our farmers is increasing and generally lacks education and scientific expertise in this area. Our main problems in the agricultural sector are the lack of sufficient attention to the extension and research sector; despite the food production capacity of 400 million people, we cannot have this possibility and the capacity to use it properly. There is also a serious problem: the lack of effective communication between the farm and research and promotion in the agricultural sector, which requires more effort.

An idea to deal with the water crisis in Iran and create new water resources

Undoubtedly, naming this century as "water" by economic and political experts means paying more attention to this vital fluid. Water has been essential for a long time. In recent decades, especially in the last years of the twentieth century, water has been an essential topic of international debate. Water problems, issues, and shortages were raised locally in previous years. But in the current and more significantly in the future, these problems will occur on a national, regional, and even global scale [16-20]. Iran is also one of the countries facing water shortages in the drinking and agricultural sectors, and due to population growth, this problem will become more pronounced shortly. So, it is necessary to think of a way to deal with it.

Natural geography of Iran in the past

In the third and fourth geological periods, i.e., the mysterious period of Europe in the ice age, the Persian Gulf was located in a larger area than today. About 5,000 years ago, this historic sea was located 200 km north of the present coast, and ships could almost certainly have risen as far as Susa. This physical and climatic quality shows that the plateau was green for several millennia. Its people in a geographical unit of Abad could continue their lives without the need for lands across the plateau [21-25]. He writes: Around 6000 BC or shortly before that, the central region of Iran, which is now a desert, was

composed of a large lake that overlooked the melting of the snow in the surrounding mountains across the plateau of Iran and along the small rivers of this lake, the first communities of Iranian civilization were formed and because of this lake Gradually, the relics of those communities have disappeared and only in Kashan and some other places, examples of the effect of human habitation in these areas remain for us [26]. According to ancient writings, regarding the art and civilization of ancient Iran, the humidity of the Iranian plateau in ancient times was higher than that of today. According to the famous American Oriental Jackson, in Avesta, a large forest called White Forest was mentioned, which was located in present-day Khorasan, but now no trace of it remains. Historians and scientists who came to Iran with Alexander in their treatises talked about wars and meadows around Kerman and Sistan that no trace of them can be seen today, which shows the mentioned changes. Geological and geographical research shows that Iran's Green Plateau gradually tends to become more dried and pushes back the central deserts of the settlements (desert advancement). This causes the destruction of forests and the reduction of settlements. This transformation is a factor in reducing rainfall and drought and the wetness of relatively settled lands and formations as it is now [28].

The situation of water resources in neighboring countries of Iran

The Middle East and Central Asia are among the driest and driest regions globally. Of course, not all countries in the region are affected by water shortages, including Afghanistan and Turkey, as two prominent examples of good water resources. Turkey is located in the Mediterranean, adjacent to the Black Sea, and the existence of high mountains has a good rainfall, which is the source of the Tigris and Euphrates rivers in this country. Afghanistan also has large rivers such as the Amu Darya, Kabul, Harirod, and Helmand rivers. More than three-quarters of Afghanistan's territory comprises soaring mountains, ranging in height from 4,000 to 5,000 meters above sea level. The mountain range has large glaciers that are the permanent water source for Afghanistan's rivers. As mentioned above, Afghanistan is rich in water resources; the total water capacity of Afghanistan in normal water years is more than 75 billion cubic meters of water. Of this amount, 57 billion cubic meters is surface water and 18 billion cubic meters. The cube consists of groundwater resources. Afghanistan has three water basins in terms of natural geography and location of its mountains: Pamir and North Hindu Kush water basins, South Hindu Kush and Sefid Kuh water basins, and Helmand and Harirod water basins. Pakistan's water resources are geographically indebted to its eastern and western neighbors [11].

Water resources of Iran

Although Iran occupies 1.1 % of the world's land area, it has only 34 % of its land water. On the other hand, rainfall occurs mainly in the spring in most parts of Iran, which does not require much water for agricultural activities. Also, rainfall does not fall uniformly in the country. The average rainfall in the world is about 800 to 820 mm (more than 3 times that of Iran). More than 70% of precipitation evaporates and returns to the atmosphere. The evaporation rate is 3 times the global average. It should be noted that the same small amount of rainfall (about one-third of the global rate) does not have the same spatial distribution so that in 28% of the country, the average annual rainfall is less than 100 mm; the amount is less than 200 mm in 96% of the country. The sub-arid climate is predominant in 15 provinces, and the problem of high evaporation is a double limit [12].

Weather

Iran has a diverse and different climate, and this can be well observed by comparing different parts of the country. The height of the northern, western, and southern mountains is so high that it prevents the general influence of the humid winds of the Caspian Sea, the Mediterranean Sea, and the Persian Gulf in the interior of Iran. Therefore, the outer slopes of these mountains have a humid climate, and the inner slopes are dry [23]. Based on the above, it can be concluded that most of the deserts of Iran are topographic

deserts. The Alborz and Zagros mountains have prevented rainy winds from entering the country, leading to a lack of moisture and the creation of deserts. Will the existence of a lake in the desert plain affect the country's climate?

Artificial lake

Assuming a lake in the Dasht-e Kavir region to transfer the required water from the Caspian Sea or the Oman Sea to the region, what will be the result? The Dasht-e Kavir is above the orbit of 30 degrees latitude, so if water evaporates from the surface of the lake does not cause transpiration problems (subtropical deserts). The desert plain is located near the Alborz and Zagros mountain ranges. Due to the high temperature in the desert plain, water can be expected to evaporate from the lake surface (cloud formation). The low-pressure areas (surrounding mountains) would create wind and rain. Of course, referring to the history of Iran (a lake in central Iran) and the existence of salt marshes and relatively low altitude of the desert plain, this issue is not so unlikely and far from reality [3].

Artificial Lake Implementation Method

The impact of the lakes on the climate of the region in which they are located can certainly not be ignored. The role of Caspian Lake or Lake Urmia in the climate and the appearance of rivers in that region is quite tangible; the northern region of the country has a good rainfall thanks to the high mountains of Alborz and adjacent to the Caspian Sea. As for the Dasht-e Kavir, will the same issue not be repeated? Can we not expect increased rainfall and change in vegetation in the southern part of the Alborz mountain range and the eastern part of the Zagros?

Strategies of Water Resources in Desert and Desertification

The necessity of providing water for life is one of the issues that have been on the agenda of world assemblies and governments since the beginning of the third millennium, and they have been obliged to provide structural measures and transfer between water basins and management measures (simultaneous supply and demand management) to provide water for the general public. To achieve this, the World Water Council has created a comprehensive policy between governments and stakeholders and paid attention to this issue; the main topic of the fourth meeting of the World Water Forum held in Mexico was "Regional Actions of Global Water Challenges". The world community predicts that by 2050 the issue of water resources will be the main topic of discussion in the world because by then, the world's population will reach 9.4 billion people, and as a result, water and food supply and environmental protection will be the most critical concern of managers and leaders of countries. This situation is particularly worrying for Middle Eastern countries. With five percent of the world's population, the Middle East has access to only one percent of freshwater [4].

On the other hand, the region's economies are heavily dependent on two main factors due to lack of industrial infrastructure: Agriculture and oil, accounting for about 85% of the region's water. Although these countries are more interested in standard water basins than in their oil rigs, the situation has recently resulted from the conflict. The Palestinian-Lebanese-Israeli reconciliation has further jeopardized the half-hearted compromise between the two countries and therefore does not offer a promising outlook for their water resources. According to the United Nations, the average reduction in available water worldwide will be reduced by one-third in the next twenty years. According to the estimates, any country with an average per capita water availability of less than 1,700 cubic meters is dangerous. If this amount is less than 1,000 cubic meters per person per year, that country is in a state of water shortage. According to this index, in 1990, the United Nations examined the status of available waters globally, and 11 countries in the Middle East were on this list. It is predicted that by 2025, and if the current situation continues, Egypt, Ethiopia, Iran, Libya, Morocco, Oman, and Syria will also join this list [4].

Important Indicators of Desertification from a Water Perspective

Groundwater Level Drop

Irregular groundwater abstraction in many parts of the world has caused a sharp decline in groundwater aquifers. Statistics from global sources show the plight of this heartbreaking story. For example, Chicago's groundwater level could drop by 274 m over 118 years, and 91 to 152 m by groundwater level in southern and central Arizona, followed by a 3.81 m of land over the past 60 years, as well as the 8.5 m subsidence in some urban areas of Mexico. The annual decline in India's groundwater has posed a serious threat to about 25 % of the country's agriculture. In general, the volume of groundwater reservoir volume in the world is estimated between 750 to 800 billion cubic meters per year, one percent of which belongs to Iran. Improper groundwater abstraction causes another crisis in salinization of water resources. Due to the imbalance between saline and fresh water, saline water advances in the freshwater bed of groundwater aquifers. The gradual increase in the salinity of groundwater under exploitation is a severe beginning for salinization and, finally, the destruction of land resources in the direction of desertification. According to reports published by the Ministry of Energy, in Iran, groundwater aquifers in most plains of the country are not in good condition [5]. According to the statistics of the water year of 2002-2003, about 74.6 billion cubic meters of water is extracted through wells, springs, and aqueducts from the country's groundwater resources, of which about 60% of the extracted water is through more than four hundred and fifty thousand wells. However, only 28% of the existing wells in the country are deep. However, the rate of exploitation of these wells includes more than 69% of the total discharge of wells in the country, and out of the total number of existing wells, about 268 thousand wells have been drilled in free zones and 190,000 wells in restricted areas. On the other hand, the latest statistics show that out of 609 study areas, 225 have been declared banned and the regional water companies have proposed another 45 areas to the Ministry of Energy. An examination of the available statistics on groundwater exploitation in the country's main areas shows that in contrast to 57.7 billion cubic meters of groundwater discharge, about 50.7 billion cubic meters have been fed. In other words, about 7 billion cubic meters more than the amount of groundwater recharge has been exploited. In most parts of the country, the level of groundwater aquifers has dropped sharply, and its level is negative. For many years, irrigation has been the most straightforward and only pain reliever to produce more food in desert areas, but due to incorrect and unscientific methods and only traditional irrigation, in addition to the limited water loss in these areas, in many agricultural lands have become deserts [6].

Agricultural development is one of the problems of Iran's agriculture by expanding irrigated cultivation instead of increasing production per unit area. In contrast, low irrigation efficiency in the agricultural sector is due to structural problems such as small units and a low level of farmers' awareness. Lack of proper technical knowledge, traditional cultivation methods, lack of proper water supply networks, and lack of water consumption management are the leading causes of quantitative decline and waste of water resources in Iran, so the efficiency of water consumption in agriculture is calculated on average by about 30%. In many parts of Iran, problems such as drying water wells, reduced river discharge, degraded water quality, subsidence, and interference of saline and freshwater aquifers have occurred due to falling water levels and desertification in the area. This phenomenon has emerged as a severe and significant challenge in many parts of Iran, a clear example of which can be found in Kerman province. For example, in the Rafsanjan plain, where the pumping of wells was at a depth of 50 to 80 meters m above the ground at the beginning of the Islamic Revolution. However, it has now increased to 300 m and more, and its quality in many areas due to saline water intrusion is seriously threatened, and bad has gotten worse. Experts predict that if there is no solution to transfer water to this plain (transfer between water basins), the destruction of orchards and groundwater aquifers will

continue. In this way, in twenty years, all these gardens will be turned into burnt cities, which may not be possible to improve them even with sufficient water transfer and with the desired quality, and in a word, they will become deserts. Therefore, it can be said that in agricultural affairs, any plan and program to improve and improve the quality and quantity of irrigation to prevent water wastage and loss is indirectly a solution to curb desertification. Therefore, water consumption, control, and optimal use of surface water resources can be enhanced by implementing programs to increase irrigation efficiency in the agricultural sector using scientific and modern irrigation methods (pit, drip, pressure, and the like). And the balance of aquifers and meals is considered to prevent the phenomenon of desertification.

Flooding and Occurrence of Destructive Floods

The increase and flow of destructive floods are severe consequences of desertification. According to published statistics, the number of floods from 1939 to 1999 reached 3700 cases, increasing more than 10 times. Evaluation of environmental factors that underlie these events suggest that the probability of flooding in different areas has increased, and the rain of divine mercy has become a destructive phenomenon, has caused the loss of human life and property, and in many areas has destroyed agriculture, agriculture, and infrastructure of the country. This situation indicates the emergence of a situation that affects the country's natural resources. Rare and torrential rains in the country's arid and semi-arid regions cause floods on more surface water in Sarab Basin by creating floods, carrying salt and gypsum sediments from the heights to the end of the route, and accumulate more than before. At the bottom of the basin, the result of this situation is the reduction of natural nutrition of aquifers in the basin mirage on the one hand and the progression of saline desert waters to the aquifers of the basin and surrounding lands on the other hand. In addition, sediments of gypsum and salt impregnated sediments in flood tombs, which are usually located in closed indoor basins, become the inexhaustible source of saline soils and sands that contaminate the surrounding areas and cause soil degradation and eventually complete loss of fertility. They become soil, and, in a word, desertification of the region takes place. Also, despite being small and weak, surface running water can gradually contaminate the large areas under its influence by saline washing of salt domes located in the ground or mining salt mines. In the long run, this gradual leaching leads to desertification of the region. These brief explanations call for attention to the upstream watersheds for desertification control programs. This action has not been given enough attention so far, especially by the executive departments of natural resources. Only desertification control operations have been sought at the site of occurrence and emergence of the effects of this phenomenon. Therefore, contrary to expectations, any action taken in the upstream areas of watersheds to prevent the occurrence and intensification of floods can be considered an action to curb desertification, whether this is done by the watershed management department of the Ministry of Jihad Agriculture or the Ministry of Energy. Most of these units inside and outside the organization are necessary to achieve the desired goal [28].

Water Pollution and Salinization

As mentioned earlier, the agricultural sector accounts for about 94% of the country's water consumption. Due to the vast area of the country, improper use of water resources and agricultural inputs (fertilizers and pesticides) can pose a severe threat to the country's water resources in terms of quantity and quality. One of the primary sources of agricultural water pollution is the increasing use of agricultural inputs. These include chemical fertilizers and pesticides. Agricultural pesticides and chemical fertilizers, which have been used extensively in recent years to control pests and strengthen the soil, have infiltrated surface and groundwater resources, causing pollution of the country's water resources. Existing statistics show that chemical fertilizer consumption has increased from 630 million tons in 1976 to more than 3 billion tons in 2002. Consumption of agricultural pesticides as a chemical fertilizer shows a similar trend, and its consumption has grown

relatively in recent years. It has been so significant that the amount of pesticide sales in the country in less than a decade has increased from 14,800 tons to 25,800 tons (2002). This increase in consumption occurs when many countries, especially developed countries, have severe restrictions on their consumption, and its consumption has been declining in recent years in these countries. Inefficient use of agricultural inputs and irrigation and inadequate drainage of irrigation networks has caused many agricultural effluents to enter the country's water resources through rivers and drains annually and provide the ground for pollution and salinization of many water resources. Annually, 20 million tons of untreated wastewater flows into inland waters, the Caspian Sea, and the Persian Gulf. About 163 polluted rivers have been identified in the country, of which 70 to 60 rivers are the most polluted.

In addition to the salinity of Kahjabar water, the effect of agriculture is incorrect. Due to the saline geological formations in many arid regions of Iran, salinization of water also occurs naturally. Salt marshes and groundwater aquifers are not limited. The biggest problem is the existence of geological formations containing evaporative sediments such as gypsum and salt, which exist in almost all parts of Iran. In general, salt deserts act as the main center of salt dispersion. In the superficial part by water and possibly wind and in the deep part by the infiltration of saline water flow have their destructive effects on the surrounding lands, thus runoff from the upper areas of the basin. In many cases, they become saline due to passing through the same formations contaminated with gypsum and salt. In addition to being of unsuitable quality for drinking or agriculture, they also contaminate their downstream areas and in some way cause their formation and formation.

Conclusion

Suppose the activity is done in the field of resources and with a national and national perspective and securing the whole country's interests. In that case, it can assign and draw the correct planning of God-given resources. Water, like oil, is a national resource and does not belong to a specific point and must be allocated in government and national planning. This program and allocation in the format of optimization are done. For example, the national goal is self-sufficiency and not importing wheat and other agricultural products. Producing a ton of wheat where water and soil resources are available and suitable will undoubtedly cost less. Therefore, the supply of wheat needed by the people, which is a matter of government, should be government planning. The distribution of water from different sources should be done accordingly. There is no doubt that the development and implementation of water projects are necessary to raise the people's standard and standard of living. Water programs must be developed to help the people, but this is done without draining groundwater, drying rivers, or deforestation will not be accessible. Water resources cannot be used optimally unless the three main principles of water use efficiency, justice in water distribution, and maintaining ecological and ecological balance are observed. There is ample evidence that water distribution is not fair in Iran, and this process can not last forever. If we consume water with high efficiency, the needs of other citizens can be met without interrupting the urban needs. Using efficient methods, we can reduce water consumption in the agricultural sector by 10 to 15 %, industries 40 to 90 %, and cities up to 30 %. New technology and the application of new methods can help us provide enough water, but it will not go on indefinitely. Especially in the conditions of our country where population growth is high, only saving water consumption cannot be effective. However, the population growth rate must be controlled, and perhaps the only way to deal with water shortages is to control the population.

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