RESEARCH PAPER

The importance of the aqueduct and its regeneration and repair in South Khorasan province: A case study Sarbishe city

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Abstract

Due to the dry and semi dry weather that is governed in South Khorasan province, we see little rate of annual and seasonal rainfall in the province. Therefore, water resource management is the main and emphasized issue. In South Khorasan province water requirements for different sectors including domestic, industrial, agricultural, etc. is supplied through deep and semi-deep wells in the vast and talented plains and aqueducts and fountains in the villages and even in some cities. Sarbishe city also is no exception and a huge part of their requirements is provided through aqueduct water. So the study has been carried out with the aim of assessing the knowledge and attitudes of villagers to aqueduct repair & rehabilitation. This research is a descriptive correlational research and was conducted using survey method. The study population comprised 6388 subjects that among them 320 were selected using Cochran formula, and using sampling method 150 people have been studied. Researcher made questionnaire was the data collection tool which its validity was confirmed by a panel of experts, and its Cronbach's alpha (α) reliability coefficient was found .88 that was desirable. Results show that villagers have high awareness about aqueducts and have relatively negative attitudes to rehabilitation and repair of aqueducts and its importance. Research correlation analysis expresses it. In addition, the findings showed that villagers have high awareness about aqueducts and have relatively negative attitudes to rehabilitation and repair of aqueducts.

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Introduction

Iran, in terms of the available fresh water resources according to the statistics is facing great shortage (Alizadeh, 2007). South Khorasan province is also of threatened areas in both terms of human capacities and natural conditions (South Khorasan Agricultural Organization, 2013). Indiscriminate digging deep and semi-deep wells with no plan for agricultural development and job creation, etc, and some mistakes policy caused many areas, today, such as plains be encountered with threat of water shortages, earth summit, the disruption of ecosystems and so on. Among these aqueduct due to its functions in various sectors of economic, social, cultural and environmental has great place is also threatened, hence much attention is needed. And deserves to be taken technical, administrative and legal measures with the aim of balancing at water supply and demand and utilization of aqueducts, until by this way and the presence of the aqueducts, Iranian masterpiece, can be managed the some problems of water shortage. In this regard, present study has been done aimed to assess the knowledge and attitudes of villagers about aqueduct repair & rehabilitation. Fdakardavrany, in a research with the title of aqueduct role in sustainable rural development, look at the aqueduct from different angle. Main assumption is that the water supply by the rural people using social networks and aqueducts required to storage and membership and use of aqueduct water, can be considered a source of increasing desire to advance, the creation of communal space, and strengthening the empowering spirit towards realize sustainable development of rural (Fdakardavrany, 2010). Lotfi and Abarsajy, reviews the maintenance and management of aqueduct in Gorgan. For this purpose, 10 villages were selected as sample and research was conducted on 10 available aqueduct, which by field research and consultations with pioneers aqueduct proposed some strategies to aqueduct maintenance and management (Lotfi, Abarsajy, 2006). Abdi, in a study entitled " Review the aqueducts situation at Zanjan province and providing solutions for improving the utilization and their protection and restoration", due to the impact of aqueducts on human social and economic life in order to preserve, restore and maintain the aqueducts especially use of this phenomenon capacity, has been investigate the aqueducts situation at Zanjan province in terms of usage and preservation and presentation of solutions to optimize and improve the operation and the reduction. Based on the results of this study in Zanjan province, there are nearly 950 aqueducts, from this number 729 are operated by strings discharge rate of 120 million cubic meters, and the rest remain to be abandoned. Researcher also due to supply the 65 percent of province water need by the groundwater, considered essential to the restoration and repair and maintenance of aqueducts, and considered that control and containment of upstream surface water aqueducts and feeding it into the ground as spread floodwaters, repair and dredging operations continuously, drilling ban, technical and financial assistance and etc are implemented solutions in this area (Abdi, 2005). In South Khorasan now there are 8,000 aqueducts that only 6006 strands have been identified and recorded (South Khorasan Agricultural Organization, 2013). According to the above can be realized the importance of aqueduct as an important and strategic water source in all parts of the city Sarbishe. The present study examined the villagers' attitudes about aqueduct and aqueduct position among villagers of city Sarbishe until by providing appropriate solutions to the Iranian monument be able to contribute, though small, to the aqueducts survival.

Definitions of aqueduct and rehabilitation and repair

Aqueduct is a traditional structure with more than two thousand years old with less depreciation which was formed thousands of years and by extraction of ground water is the source of appearance of villages and cities (Alizadeh, 2007). Aqueduct as a works of Iranian civilization and proud certificates of Iran from centuries ago up to now and after this will be the only source of clean water (Rahimi, Momeni, 2005). Aqueduct is a corridor and underground waterways which have one discharge source called wells mother and several hole in the ground for air-conditioning and related work and a place for water harvesting on

ground level called Mazhar (Agricultural Organization, 2013). Aqueduct Rehabilitation and Restoration Project Dredging, collapse loads collection, and retrofitting the walls of the furnace and bars wells called aqueduct repair & rehabilitation that thereby water extraction from the aqueduct be used as efficiently healthy (Agriculture organization, 2013).

Research Methodology

The present study, in terms of target is applied research because pays to understanding the current situation and the development of practical knowledge in a particular field and in terms of the amount and degree of variables control is a field study. From time dimension is a prospective research and the nature of the data is quantitative. In terms of method, this study is of descriptive - correlation group, because

through identification and characterization of existing space to analyzed the relationship between variables. In this research statistical population are aqueduct exploiters and rural households of desired area. Cochran's formula was used to determine sample size and cluster sampling method was used for sampling. Then subjects to answer a designed questionnaire selected randomly.

Research Findings

Descriptive Findings

In this type of analysis, all elements of society and calculate its parameters by the census are described (Taheri Larry, 2007). In this section, rate the performance operations at villages aqueducts were asked of villagers and its results are detailed in below frequency table.

Table 1: Frequency distribution of the subjects according to the placing gorget in the aqueduct

Placing a concrete circular pipe	Frequency	Frequency percent	Cumulative frequency
Less than 158 meters	58	38.7	38.7
Between 158 to 256 meters	76	50.7	89.3
Between 256 to 354 meters	12	8.0	97.3
More than 354 meters	4	2.7	100.0
Total	150	100.0	

Average: 195/17 , SD: 71/02, Maximum: 450 meters, Minimum 60 m

According to the findings contained in the above table, the maximum frequency of studied subjects belonged to the placing gorget between 158 and 256 meters and the mean of placing gorget operation was 159 meters.

Table 2: Frequency distribution of the subjects according to the unloading in the aqueduct

Unloading	Frequency	Frequency percent	Cumulative frequency
Less than 160 meters	47	31.3	31.3
Between 160 to 290 m	47	31.3	62.7
Between 290 to 420 meters	24	16.0	78.7
More than 420 meters	32	21.3	100.0
Total	150	100.0	

Average: 267/47 , SD: 167/16, Maximum: 550 meters, Minimum 30 m

According to the findings contained in the above table, the maximum frequency of studied subjects belonged to the unloading less than 290 meters and the mean of unloading operation was 267 meters

Table 3: Frequency distribution of the subjects according to the placing a concrete circular pipe in the aqueduct

Placing gorget	Frequency	Frequency percent	Cumulative frequency
Less than 36 meters	16	10.7	10.7
Between 36 to 68 m	55	36.7	47.3
Between 68 to 100 meters	59	39.3	86.7
More than 100 meters	20	13.3	100.0
Total	150	100.0	

Average: 78.20 , SD: 34.02, Maximum: 130 meters, Minimum 4 m

According to the findings contained in the above table, the maximum frequency of studied subjects belonged to the placing a concrete circular pipe btween 158 and 256 meters and the mean of unloading operation was 78 meters.

Evaluation the users' knowledge and recognition about aqueduct repair & rehabilitation

In this section to assess the level of the users' knowledge and recognition about aqueduct repair & rehabilitation the subjects were asked, and after data collection, and zero point were awarded for correct answer and one point were awarded for wrong answer. Then coefficient of variation (CV) was used to ranking elements of knowledge and recognition and ISDM formula for determine the level of villagers' knowledge and recognition about the aqueduct as follows:

Table 4: Prioritize indicators related to villagers' knowledge and recognition about the aqueduct structures

Items	Mean	Std	Cv	R
pond and dams in the privacy of aqueducts are effective in reducing the discharge	1/72	0/45	26/16	5
balancing aqueducts for leveling downstream lands	1/21	0/41	33/88	8
aqueducts privacy influence is high in discharge area	1/23	0/42	34/14	9
Strengthen aqueducts with stones to prevent of walls loss	1/18	0/38	32/20	6
Increasing aqueducts' gradient for increasing discharge	1/24	0/42	33/87	7
Entering to aqueducts for detailed information acquisition	1/07	0/26	24/29	4
Water discharge by pump in case of pouring furnace	1/37	0/48	35/03	10
Dredging to increase water flow	1/02	0/14	13/72	1
Flooding led into the mother wells for feeding aqueducts	1/8	0/39	21/66	2
Close the head of wells to prevent entry of sand	1/06	0/24	22/64	3

According to the findings contained in the above table can be seen that the last priority with coefficient of variation 35/03 is related to index of (Water discharge by pump in case of pouring furnace) and the first priority with coefficient of variation 13/72 is related to index of (Dredging to increase water flow).

Table 5: Frequency distribution of the subjects according to the level of knowledge and recognition about the aqueduct

Level of Knowledge and awareness	Frequency	Frequency percent	Cumulative frequency
low	21	14.0	14.0
Average	53	35.3	49.3
Good	58	38.7	88.0
Top	18	12.0	100.0
total	150	100.0	

The findings, contained in the above table indicate that the 14% of people has low knowledge and recognition about the aqueduct, 35/3% has mean knowledge and recognition about the aqueduct and 50/7% has very high knowledge and recognition about the aqueduct

Assessing the villagers' attitudes about the aqueduct and its' restore and repair

Various social groups' attitudes are different due to the benefits of partnership. On the same basis societal attitudes can be seen as one of the factors involved in the increase or decrease in social contributions. So attitudes should determine how to deal with the environment around us, how see the world, what we expect from others (Danesh mehr, Ahmadrash, 2009, 8). For this purpose, to assess the level of the Sarbishe villagers' knowledge and recognition about aqueduct repair & rehabilitation the subjects were asked, and after data collection, coefficient of variation (CV) was used to ranking elements of knowledge and recognition and ISDM formula for determine the level of villagers' knowledge and recognition about the aqueduct as follows:

Table 6: Prioritize indicators related to villagers' attitude about the aqueduct structures

Items	Mean	Std	Cv	R
Importance of preservation of the aqueducts	1/34	0/6	44/77	4
Job creation of aqueduct repair & rehabilitation schemes	2/39	1/2	50/20	10
aqueduct maintain cause to continuity of residence in the village	1/58	0/89	56/32	11
effective ownership and partnership on aqueduct repair & rehabilitation schemes	1/82	0/89	48/90	8
young people being aware of the importance of aqueduct	2/25	1/07	47/55	6
presence of young inside olders led to works perform better	1/6	0/80	50	9
Aqueduct Rehabilitation and restoration is women and childrens' work	4/3	0/94	21/86	2
Effectiveness of the aqueduct on the villagers' life	1/94	1/148	59/17	12
the aqueduct is the lifeline of village	1/32	0/6	45/45	5
digging deep wells instead aqueduct	3/18	1/54	48/42	7
Decrease aqueduct water due to restoration of aqueduct	4/17	1/04	24/94	3
the aqueduct rehabilitation and restoration farce and a waste of credit and charge	4/53	0/87	19/20	1

According to the findings contained in the above table can be seen that the last priority with coefficient of variation 59/17 is related to index of (Effectiveness of aqueduct on how villagers life) and the first priority with

coefficient of variation 19/20 is related to index of (Aqueduct repair & rehabilitation is farce and a waste of credit and charge).

Table 7: Frequency distribution of the subjects according to the level of subjects' attitude about aqueduct repair & rehabilitation

Level of community involvement	Frequency	Frequency percent	Cumulative frequency
Negative	26	17.3	17.3
Relatively negative	55	36.7	54.0
Relatively positive	47	31.3	85.3
positive	22	14.7	100.0
total	150	100.0	

The findings, contained in the above table indicate that 54% of people have relatively negative and negative attitude about aqueduct repair & rehabilitation and 46% of people have relatively positive and positive attitude about aqueduct repair & rehabilitation

Assess the level of government policy in relation to the aqueduct

In this section, to assess the level of government policies, subjects were asked and after data collection, each indicator was scored which the lowest points was one and maximum points was five, coefficient of variation (CV) was used to ranking elements of government policies and ISDM formula for determine the level government policies as follows:

Table 8: Prioritize indicators related to government policies structures

Items	Mean	Std	Cv	R
Culturalizing and encourage farmers to start-up companies	2/94	1/254	42/60	5
Setting the aqueduct safety & protection guidelines	3/82	1/168	30/57	2
Volunteer appointed by the Government	3/21	1/078	33/58	3
Conducting training workshops about aqueduct	4	1/039	25/97	1

According to the findings contained in the above table can be seen that the last priority with coefficient of variation 42/60 is related to index of (Culturalizing and encourage farmers to start-up companies) and the first priority with coefficient of variation 29/57 is related to index of (Holding educational workshops about aqueduct).

Table 9: Frequency distribution of the studied subjects based on the level of government policies

Level of community involvement	Frequency	Frequency percent	Cumulative frequency
Weak	24	16.0	16.0
Relatively weak	38	25.3	41.3
Relatively strong	61	40.7	82.0
Strong	27	18.0	100.0
Total	150	100.0	

The findings, contained in the above table indicate that 16% of people told that government policies were weak about aqueduct repair & rehabilitation, 25/3% of people told that government policies were relatively weak about aqueduct repair & rehabilitation and 58/7% of people told that government policies were relatively strong and strong about aqueduct repair & rehabilitation.

Assess the studied subjects' satisfaction of experts

In this section, to assess the level of the studied subjects' satisfaction of experts, subjects were asked and after data collection, each indicator was scored which the lowest points was one and maximum points was five, coefficient of variation (CV) was used to ranking elements of satisfaction of experts and ISDM formula for determine the level of satisfaction of experts as follows:

Table 10: Prioritize indicators related to satisfaction of experts structures

Items	Mean	Std	Cv	R
Usefulness of holded classes and meetings	3/39	1/268	37/40	1
Track and attract funding for rehabilitation and restoration by experts	3/13	1/235	39/45	4
Attention to the request of the Owner	3/08	1/323	42/95	5
How much academic aqueduct studies by experts	3/16	1/217	38/51	3
Satisfaction of experts' performance about aqueduct	3/30	1/242	37/63	2

According to the findings contained in the above table can be seen that the last priority with coefficient of variation 42/95 is related to index of (Attention to the operators' request) and the first priority with coefficient of variation 37/40 is related to index of (Usefulness of holded classes and meetings).

Table 11: Frequency distribution of the studied subjects based on the level of satisfaction of experts

Level of community involvement	Frequency	Frequency percent	Cumulative frequency
Low	24	16.0	16.0
Relatively low	42	28.0	28.0
Relatively high	13	8.7	8.7
High	71	47.3	47.3
Total	150	100.0	

The findings, contained in the above table indicate that the 16% of people has low satisfaction of experts, 28% has relatively low satisfaction of experts and 56% has relatively high and high satisfaction of experts.

Findings of inferential statistics

Results from present study using the Pearson correlation test showed that:

Table 12: determine the relationship between studied variables

aqueduct repair & rehabilitation	Satisfication of expert	Governmetc pilicies		people attitudes about aqueduct
-.042	-.341**	-.334**	Pearson coefficient	
.610	.000	.000	Significant level	
150	150	150	Number of samples	

Source: research findings

The above findings indicate that there is no statistically significant relationship between the subjects' attitudes of aqueduct repair & rehabilitation and the amount of aqueduct repair & rehabilitation in villages.

Research findings indicate that there is a negative and significant relationship with 99% confidence between the subjects' attitudes about aqueduct repair & rehabilitation and villagers' satisfaction of governmental experts. In other words, whatever subjects' attitudes of aqueduct repair & rehabilitation being negative, proportionally villagers' satisfaction of experts being lower.

Research findings indicate that there is a negative and significant relationship with 99% confidence between the subjects' attitudes about aqueduct repair & rehabilitation and government policies. In other words, whatever subjects' attitudes of aqueduct repair & rehabilitation being positive, proportionally government policies about aqueduct being weaker.

Conclusion and Recommendations

In the present study, the results of the descriptive statistics showed that 50/7%of people belonging to the placing a concrete circular pipe for aqueduct between 158 to 256 meters and maximum rate of placing a concrete circular pipe for aqueduct was 450 meters and its minimum rate was 60 meters. It also showed that 62/6% of people had less than 290 meters unloading at the aqueduct that the maximum unloading operations at the aqueduct was 550 meters and its' minimum rate was 30 meters. Also 39/3% of people belonging to the aqueduct placing gorget between 68 to 100 meters and maximum rate of aqueduct placing gorget as 130meters and its minimum rate was 4meters. Based on these results, using ISDM test it was observed that 38/7% of people had good knowledge and awareness of aqueduct and issues related to it and 36/7% of people had relatively negative attitude about aqueduct repair & rehabilitation. Based on Pearson correlation test it was observed that there is a significant relationship between the subjects' attitude about aqueduct and level of aqueduct repair & rehabilitation, thus the null

hypothesis is confirmed. And there is a negative and significant relationship between the villagers' satisfaction of experts and government policies about aqueduct, thus the null hypothesis was rejected. Thus the following suggestions are presented for better aqueduct repair & rehabilitation:

Holding classes and workshops to improve people awareness about aqueduct and importance of aqueducts maintaining

Providing a ID for aqueducts, only in this case can be identify and determine all related parameters to aqueduct (discharge rates, length, depth of wells, number of owners, etc). And placing it at the disposal of farmers can be helped to their knowledge about their own village aqueducts.

Government in relation to policy making and legislation for aqueducts considered the region and people conditions and by government agencies examined the peoples' recommendations and guidelines, if required to take advantage of them.

Raising peoples' attitude by holding conferences and joint meetings between people and government.

Increased funding and facilities for aqueduct repair & rehabilitation in provincial and city-level according to the number of aqueducts and aqueducts existing conditions of each region

As far as possible villages that are exposed to be aqueduct repair & rehabilitation projects, before implementation, objectives, benefits and purposes, completely justified to exploit and residents.

Greater attention to the education and promotion programs in rural areas and providing local programming through Radio and TV could have substantial impact on people's attitudes about aqueduct.

References

Abdi P. 2005. Investigate the aqueducts' situation of Zanjan and provide solutions to enhance their utilization and conservation and restoration, 10

Alizadeh A. 2007. Principles of Applied Hydrology, Mashhad, Razavi Publications, Nineteenth Edition (with revisions), 22-398

Fadakar D, Mohammad M, Samaram E. 2010, Aqueduct role in the rural sustainable development , Journal of Rural and Development, Year 13, second edition, 2011, 5-6.

Lotfi M, Abarsajy GH. 2006. maintenance and management of the aqueduct in Gorgan, Yazd International Conference on Aqueduct, 12-14.

Rahimi H, Momeni J. 2005. Aqueduct role in the sustainable development of arid and semiarid regions of Iran, 2-4.

South Khorasan Agricultural Organization, 2013. website: www.kj-agrijahad.ir.

Taheri LM. 2007, Research methods based on knowledge in management Ferdowsi University of Mashhad Institute of Printing, Derakhshesh Publication, First Edition, 227.