

SOCIO-ECONOMIC AND ENVIRONMENTAL IMPACTS OF THE WATERSHED MANAGEMENT PROJECTS IN DAM CATCHMENT

Soleiman RASOULIAZAR¹, Saied Fealy NAHAVAND²

¹Islamic Azad University, Mahabad Branch, Department of Agricultural Management, Mahabad, Iran, Email: rasouli88s@yahoo.com

²Tarbiat Modares University, Tehran, Iran

Corresponding author: rasouli88s@yahoo.com

Abstract

The purpose of this descriptive-correlation study was to investigate socio-economic and environmental impacts of the watershed management projects in Mahabad's dam catchment. The research instrument was structural questionnaire with close-ended questions which its validity and reliability was confirmed. The target population of this study consisted of all householders who lived in Mahabad's dam catchment (N=2,458) out of which, according to Cochran's formula, a number of 175 people were selected using cluster sampling in a simple randomization method (n=175). The descriptive results indicated the status of environmental, economic, and social impacts of watershed management in Mahabad's dam catchment were at nearly high, nearly appropriate, nearly and low levels, respectively. These results also showed the main economic, environmental, and social impacts of watershed management were changing dry farming into irrigated farming, controlling flood, and attracting rural people's participation, respectively. The results of Friedman test indicated environmental and social impacts were the most and the least amount of impacts of watershed management in Mahabad's dam catchment, respectively. The results of correlation coefficient showed that there was the significantly positive relationship between land under cultivation and number of respondents' household individual who participated in agricultural activities with impacts of watershed management in Mahabad's dam catchment.

Key words: catchment, economic impact, environmental impact, social impact,, watershed management, Mahabad, Iran

INTRODUCTION

It is an undeniable fact that any activity done by human effects on the environment. In fact, these effects were landscape of human activities in the nature. And identify these effects can show the weaknesses and strengths of the plans. The evaluation of watershed projects was implemented have an important tool for managers and executives to evaluate the effects of these projects. This evaluating process not only evaluate and progress of projects, but shows and determined the effects of these projects on various groups such as villagers [3]. Watershed can be very large (e.g. draining thousands of square miles to a major river or lake or the ocean), or very small, such as a 20-acre watershed that drains to a pond. A small watershed that nests inside of a larger watershed is sometimes referred to as a sub watershed. In mountain upland areas, there are unique blends of climate, geology, hydrology,

soils, and vegetation shaping the landscape, with waterways often cutting down steep slopes [13].

Watershed management is an adaptive, comprehensive, integrated multi-resource management planning process that seeks to balance healthy ecological, economic, and cultural/social conditions within a watershed. Watershed management serves to integrate planning for land and water; it takes into account both ground and surface water flow, recognizing and planning for the interaction of water, plants, animals and human land use found within the physical boundaries of a watershed [9]. Parizangeneh [8] with his colleagues were suggests that it is very essential determining the effects of watershed management projects. But it was ignored in most developing countries. Also, Hope [5] pointed to this subjects that evaluated the effects of watershed management projects was very essential to provide information about what actions (good design) for whom (effects)

and how (resource efficiency). Important of the Impacts of watershed management projects were caused that several studies have been done on this subject. The world must rely on family farms to grow the food it needs and to do so sustainably. For this to happen, family Farmers must have the knowledge and economic and policy incentives they need to provide key environmental services, including watershed protection, biodiversity conservation and carbon sequestration [4].

In the formulation of (watershed management) plans, both the attributes of the land and water resources and the socio-economic factors which affect the development of the human beings in the area in general, and land-use practices in particular, should be taken into account. Why is it important to know about these human activities and where they occur in the watershed? These human forces interact with the natural forces to directly shape the condition of the land and water. For example, increasing impervious surfaces in the urban areas leads to increased water and contaminant runoff; removing vegetation along drainage areas and increased storm flows lead to erosion of soils which can change the landscape to more arid conditions; increasing the velocity of the water and contaminants it contains can be lethal to living things or it can create health hazards, reducing our quality of life [13].

Drasana [2] investigated the effects of agronomic, economic - social and environmental effects of projects in Madagascar Watershed. The results showed that the project was successful in three dimensions. Drasana [2] believed people participation caused for reach to this successful and leads to the formation of trust between operators and villagers.

Also Parizangeneh et al [8] pointed that in Zanzan watershed projects has failed to attract rural participation, reduced migration, employment and the provision of water for irrigation. But in this condition watershed management project could increase agricultural production and income of rural people, increasing the size of agricultural

lands, agricultural lands to control seasonal floods and increases price of cultivated lands.

Hope [5] in his research shows watershed projects in India can't cause to increase farmers' income and access to water. Furthermore, their research shows that these projects lead on the wages of workers and a reduction in time to collect water for the household. Ghanbari and Ghodousi [3] in a similar study in the Semirom Township showed that according the internal rate of return and net present value of agricultural production watershed project having a positive effect. Moreover, they were shown that watershed projects couldn't has played an important positive role on the employment for rural people and prevent rural migration.

Sadeghi et al [10] in a study in Tehran province Kshar sub watershed management, shows that practices have a positive effect in reducing the amount of water flowing. Qualitative assessment of the results of watershed management practices (in Keshar) caused to reducing the number of flooding and water pollution. According rural point's watershed projects in the production of crops, migration of people, the vast barren lands, respectively, 63%, 55% and 37% has been effective. Also it is not significant the effects of watershed management projects on production, migration, and the extent of barren land in the study area [11]. Mirdamadi et al [7] showed that there is a significant positive relationship found between participation rates of people at different stages of the design variables of the Tehran Province Hablehrud and social groups, increasing responsibility, rising household incomes, increasing production to obtain new credit, increasing the volume of water Extraction of protecting natural resources and preventing floods and soil erosion. Also in Mirdamadi et al [7] results shows that there is no significant positive relation found between people's participation in various stages of design of the Tehran Province Hablehrud and reduce rural-urban migration, improved facilities, creating social cohesion, access to new inputs, increase job opportunities and increasing the cultivated area revealed. Mansourian and Mohamadigolrang [6] showed that watershed

projects in the Khorasanrazavi province's hasn't any effects on reduce of rural migration and employment them in rural areas. They suggest that one of the major benefits of the project was reduce flooding in the area. Also these projects don't have any effects in improving forage and satisfaction of local people in the implement of projects.

MATERIALS AND METHODS

The methodology used in this research involved a combination of descriptive and quantitative research and included the use of correlation and descriptive analysis as data processing methods. The Main purpose of the paper was to study socio-economic and environmental impacts of the Watershed Management Projects in Mahabad's Dam Catchment.

The target population of this study consisted of all householders who lived in Mahabad's dam catchment (N=2,458) out of which, according to Cochran's formula [1] a number of 175 people were selected using cluster sampling in a simple randomization method (n=175).

This area is composed of two sub home as name Kavtar and Bytas. Also Mahabad Dam is covered 82 villages, 15,374 people (2,458 households) and 79,300 hectares. Annual

precipitation of Mahabad dam laying around 1.8 million cubic meters of container per year and loss ratio of it is about 0.61 percent and at the critical situation in the country is located in the fifth dams [12]. Continue this process led to the irreparable damage and will cause damage to the local economy of rural people. Therefore in recent years some of the watershed projects like biological projects (transplant, grass lading, keeping pasture) and mechanical projects (construction sediment retention mortar, gabion dam) has been carried out in rural areas. Cronbach's Alpha coefficient was 0.85 which demonstrated that the questionnaire was highly reliable.

The questionnaire was an instrument to collect data. The data were coded and analysed by using the Statistical Package for the Social Science (SPSS 21) for windows. Descriptive statistics (frequencies, means, standard deviations, range, minimum, and maximum) were used to describe analysed data. Also in analysis statistics researcher used spearman coefficient, Freidman Test for analysing the data.

RESULTS AND DISCUSSIONS

The average age of respondents was 46 years, that the majority of them (n=85 or 48.60 %) ranged from 41 - 53 years old.

Table 1. Describe the demographic characteristics of respondents

Variables	Level of variable	Frequency	Percent	Mean	Standard Deviation	Min.	Max.
Age	28-40	52	29.7	45.82	8.22	28	66
	41-53	85	48.6				
	54-66	38	21.7				
Agricultural experience	3-17	62	35.4	23.65	12.40	3	46
	18-32	65	37.1				
	33-66	48	27.4				
Land under cultivated	2-13	102	58.3	7.12	4.31	2	27
	14-25	63	36				
	26-36	10	5.7				
Education level	Illiterate	55	31.4	5.24	4.42	-	14
	Elementary	36	20.6				
	Guidance school	37	21.1				
	High school	30	17.1				
	Diploma	10	5.7				
	University degree	7	4				

Source: Research Findings

Respondent's agricultural experience was 24 years, that the majority of them (n=65 or 37.10 %) ranged from 18 - 32 agricultural experience years. Also finding shows that the

average cultivated land by respondents was 7 hectares. Also the average of respondent's education was 5 years; also 31.4 percent of

them were illiterate. Other results are shows in Table 1.

Table 2 shows the Mean, Standard division, Coefficient of variance and ranking of economic, socio and environments effects of watershed projects. Ordinary the average of economic, socio and environments effects of watershed projects were 2.35, 2.76 and 3.51. This findings show that the situation of watershed projects in environmental effects in high level, in social effects was in average level and in economic effects was in low level. These results were shows watershed implanted projects have successful more in environmental effects rather than economic and social effects.

Also, the irrigated of l lands was according to Parizangeneh et al [8] and this finding opposite with the Hope [5] findings. Prevention of floods was according to Mansourian and Muhammadigolrang [6]; Sadeghy et al (2005) [12]; Mirdamadi et al [7]

and Parizangeneh et al [8]. And increased of people participation was according to Drasana [2] finding and opposite with Parizangeneh et al [8] findings. These effects were the main effect economic, environmental and social demission in Mahabad Dam catchment in watershed projects. For the explanation for this result could be said of many people, especially farmers has participation in some issues that prevented of soil erosion like construction sediment retention mortar, gabion dam. The increase of people occupation as economic impacts has been in the fifth rank (Table 2).

Ghanbari and Ghodousi [3] explain this Mather with that when start operations in the watershed needs to labour works. And temporary the project provides employment for the first and two years for rural people. But in later years, these actions do not attract usually rural people in the kind of tasks and activities to this type of operation.

Table 2. Prioritizing the economic, social and environments effects in Mahabad Dam catchment in watershed projects

Category	Variables	Mean	SD.	CV	Rank
Economic effects	Being irrigated arable land	3.45	0.93	0.369	1
	Increase crop production	3.80	1.11	0.292	2
	Increase in farm income	4.04	1.21	0.299	3
	Reduce costs of Farm	2.84	0.92	0.323	4
	Enhance the Employment levels in the region	2.62	1.13	0.431	5
	Increase the price of Farm lands	2.19	1.11	0.506	6
	Access to new credit	2.24	1.16	0.517	7
	Increase the Level of agricultural lands	2.07	1.12	0.541	8
	Increase forage	1.65	1.45	0.878	9
	Total	2.76	1.12	-	-
Environmental effects	Prevent floods	3.95	1.01	0.255	1
	Reduce soil erosion	3.86	0.99	0.256	2
	Rangeland Rehabilitation and prevent the destruction of pasture	3.6	1.14	0.316	3
	Probe aqueducts, wells and springs	3.26	1.42	0.435	4
	Reducing the water pollution	3.30	1.47	0.445	5
	Reducing water flowing	3.18	1.47	0.462	6
	Total	3.52	1.25	-	-
Social effects	Increasing people participation	3.85	0.92	0.238	1
	Enhance the rural quality rather than other villages	2.62	1.13	0.431	2
	Sustainability of the rural population and decrease the migration of them	2.95	1.34	0.454	3
	Creating social cohesion	1.78	1.24	0.696	4
	Gain new experience about conservation of natural resources	1.42	1.28	0.901	5
	Regional and me development	1.50	1.36	0.906	6
	Total	2.35	1.21	-	-

Source: Research Findings

The important point in this results should be considered: the relationship between the lower position to increase livestock forage (CV=0.878) in the economic impact, the position of

reducing soil erosion (CV=0.256) and reclamation and prevention of pastures (CV=0.316) as the environmental impacts and low status of migration (CV=0.454) and the

creation of social relation (CV=696) as the social impacts of watershed management projects implemented in a watershed area (Table 2).

For explain this issued must be pointed to some subjects, in recent years participation of rural people in some of the watershed projects like biological projects (transplant, grass lading, keeping pasture) and mechanical projects (construction sediment retention mortar, gabion dam) has been carried out in rural area caused to reduction and delete the use of natural resources by people. This paradox between cattle rancher's activities and conservation of natural resources by natural resource organization caused to re-education and prevent of use pasture for ranchers livestock. On the other hand, due to the rural people don't have another income activity they get to the illegal exploitation of pastures. In most subjects this material caused to they pay fines. In some cases ranchers was sold their livestock and migrate to the city. On the other hand, in some rural areas some rural volunteers exist that they are responsible for protection of natural resource? And if an individual is protected from grazing, report to the organization of Natural Resources. The same issue caused major tensions among the villagers and rural volunteers. In some cases, cause annoyance, fighting and thereby reduce the level of people's participation in such plans.

The Friedman test was used for deterring the deference's among economic, social and environmental effects of Mahabad Dam catchment watershed projects. The results shows that there is a significant differences was found among economic, social and environmental effects of Mahabad Dam catchment watershed projects ($p=0.000$; $\chi^2=121.120$).

Table 3. Ranking the economic, social and environmental effects of watershed projects

Effects	Mean rank	Rank	Classify
Environmental	2.66	1	A
Economic	1.95	2	B
Social	1.39	3	C

Source: Research Findings

The results shows that environmental effects with mean ranking (2.66) was the main effects of watershed projects and social effects by ranking mean (1.39) was the lowest effects of Mahabad Dam catchment watershed projects (Table 3).

The results of Spearman coefficient shows that there is no significant relation found between age of respondents, experience in agriculture activities and level of education with effects of watershed projects in Mahabad Dam catchment. Therefore, stating with 95% that the relationship between these variables and the effect of Mahabad Dam watershed projects, there is no significant relationship.

This status indicates that the respondents have same viewpoints about watershed projects effects.

Also finding shows there is a positive and significant relationship found between level of cultivated area ($p<0.01$; $r_s=0.402$); number of family member cooperated in agricultural activities ($p<0.05$; $r_s=0.301$) with level of watershed projects effects.

Table 4. Investigation relationship between variables and watershed projects effects

Variables	r_s	p
Age	0.078	0.347
Agricultural experience	0.318	0.145
Level of cultivated lands	0.402**	0.000
Number of family member cooperated in agricultural activities	0.301**	0.000
Level of Education	-0.153	0.064

Source: Research Findings

CONCLUSIONS

Watershed management is an adaptive, comprehensive, integrated multi-resource management planning process that seeks to balance healthy ecological, economic, and cultural/social conditions within a watershed. Watershed management serves to integrate planning for land and water; it takes into account both ground and surface water flow, recognizing and planning for the interaction of water, plants, animals and human land use found within the physical boundaries of a watershed. Watershed management provides a framework for integrated decision-making to

help: assess the nature and status of the watershed; identify watershed issues; define and re-evaluate short and long-term objectives, actions and goals; assess benefits and costs; and implement and evaluate actions. Mahabad Dam catchment area of economic and agricultural activities in rural areas is very important. And this catchment was known as one of the main arteries of the watersheds in the province of West Azerbaijan province in recent years, ie from 2008 onwards several watershed management plans as biologically and mechanical has been done in the rural areas. This study was conducted to answer the question what is the economic, social and environmental – impacts of watershed projects among rural people. The result shows that projects have a significant effect in the environment area. While in economic and social field has failed to achieve much success. Freedman's test results indicate the subject. The respondents believe that the effects of watershed management schemes is implemented in the area on issues such as attracting popular participation, flood control and irrigated agricultural lands. Unfortunately, these plans failed to have much success in employment, increase forage, migrate and establish correlations social unwillingness to play. Also, respondents with the age, history of agriculture and education, which have similar opinions, have about the effects of watershed management plan been implemented. This situation, while the increase in acreage and number of family members of respondents who are involved in agricultural activities. Their views on the effects of watershed management projects implemented in the area improved.

ACKNOWLEDGEMENTS

This research work was carried out with the support of Mahabad Branch, Islamic Azad University, Mahabad, Iran.

REFERENCES

[1]Cochran, W. G., 1977, Sampling Techniques (3rd ed.). New York: Wiley.

[2]Drasana, A., 2002, Impacts of watershed management projects in Madagascar: Case of Tsiazompaniry area. Available at: <http://www.rinya.maff.go.jp/>, Accessed on October 8, 2017.

[3]Ghanbari, Y., Ghodousi, J., 2008, Investigation the economic and social of watershed projects in Tangkhosh Catchment (Samirom City). Journal of Esfahan university researches. Vol (21), no:1. Pp: 195-204.

[4]Graziano da Silva, J., 2014, The State of Food and Agriculture. <http://www.fao.org/3/a-i4040e.pdf>, Accessed on October 5, 2017.

[5]Hope, A. R., 2007, Evaluating social impacts of watershed development in India. World Development, 35 (8): 1436-1449.

[6]Mansourian, N., Mohamadigolrang, B., 2007, Study the economic and social benefits of watershed projects in Iran (case study in Kame catchment in Khprasanrazavey province). 6th Iranian Agricultural Economic conference. 8-9 December. Mashhad, association of Iranian Agricultural Economic.

[7]Mirdamadi, S. M., Alizadehfard, M., Alimoradian, P., 2010, Investigation the relation between people participation and social-economic consequences in Hablehrud Catchment. Journal of agricultural economic and development. Vol 2-41.No:4. Pp:557-564.

[8]Parizangeneh, A. H., Jalalian, H., Yazdani, M., 2008, Evaluation of the social-economic and environmental impacts of the watershed management projects: A case study of the Zanjan river restoration project. Proceedings of Taal: The 12th World Lake Conference: 1214-1219.

[9]RDRWA, 2016, What is Watershed Management?. Online: <http://www.rdrwa.ca/node/27>, Retrieved on January 28, 2018)

[10]Sadeghi, S., Sharify, F., Forotan, A., 2005, Qualitative Evaluation the results of watersheds projects. (case study in Kan Catchment area). Journal of Geographical research. Vol (79), pp: 37-48.

[11]Sadeghi, S., Sharify, F., Forotan, A., Rezaey, M., 2004, Evaluation the results of watersheds projects. (Case study in Keshar Catchment). Journal of Research and constriction in natural resource, Vol 65. Pp: 96-102.

[12]Talebpoor Asl, D., Khezry, S., 2010, Study of the Relation between Landuse and Slope with Sediment Yield in the Southern Watersheds of Mahabad River. Journal of Range and Watershed Management, Iranian Journal of Natural Resources. 63(3). 341-358.

[13]Watershed Academy Web, 2015, Principles of Watershed Management. https://cfpub.epa.gov/watertrain/pdf/modules/watershed_management.pdf, Retrieved on January 20, 2018.