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# EFFECTS OF DAM CONSTRUCTION IN AGRICULTURAL SECTOR - A CASE STUDY OF THE HANA DAM IN IRAN

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***Abstract***

*Considering the vital role of water in all periods of human life and the increasing population, water deficit crisis was predictable. This condition lead the water experts to implement the water resource projects to supply suitable water for public population. In this paper, analysis the impact of construction the water resource projects used the Bayesian networks. The Hana dam as a case study has investigated in Iran. In this research by used the questionnaire tools score based on indexes was calculated, then by use the Netica software the total impacts index was calculated. This managerial pattern has been presented based on talents, relative advantages and sensitivity of this study. After the determining the most important parameters of Hana dam construction affect in agricultural sector through literature review and interview, summarized these effects in three groups in social, economic and ecological dimension. Then by use the sensitivity test were prioritized the major factors of the dam construction effects. Effects were classified in three categories of good, average and weak. Also the results of research indicate that the most of effects of this project (Hana dam construction for agricultural sector) was in good class category with 51.6% of total positive effects. The results of the sensitivity analysis showed that the economic nodes have the positive effect but ecological and social nodes have the positive and negative effects in Hana areas.*

***Key words****: agriculture sector, impact assessment, Bayesian networks, Hana dam, Iran.*

## INTRODUCTION

Due to rapid population growth and increasing water demands, including drinking, industrial and agricultural sectors, it is required a robust management to optimize the use of water resources. Nowadays, water is the basic subject of development in different countries in the world. Therefore in the current situation, water is considered as basic issue in commercial development and social welfare. In all countries, dams have been made with different aims, such as, water supply, power generation, irrigation, flood reduction etc. dams have been made about 60% of the world's great rivers and this subject had affected on the regional environment development. Further, in the presence of climate change, dams may play an increasingly important role in protecting water resources. For example, areas affected by severe drought and those subject to high vulnerability from flooding due to heavy precipitation will likely increase in coming decades (Intergovernmental Panel on Climate Change, 2007 in the P.H. Brown, D. Tullos, 2009). Dam construction and water development projects create wide-ranging social, economical and environmental consequences with impacts extending well beyond the initial planning area. The various impacts caused by dams and reservoirs can be on different levels: local, regional, national or international. In the few instances where dams have been found to have an effect on regional employment growth, the effect is more likely to be connected with recreational uses of the resultant reservoir rather than effects on transportation, utility, or water costs that might potentially lure water using industries to the region. The environmental consequences of large dams are numerous and varied, and includes direct impacts to the biological, chemical and physical properties of rivers and riparian (or "stream-side") environments. Dam construction and water development projects create wide-ranging social, economic and environmental effects especially consequences with impacts extending well beyond the initial planning area. Dams have contributed to human development by providing. Beyond the physical and ecological impacts associated with hydropower projects, such debates also focus on the geographical distribution of electrical power and water resources, the administrative decision-making process, the inclusion of relevant stakeholders, the relocation and resettlement of displaced inhabitants, and the disruption of social, cultural, and economic life in communities affected by dam construction. (World Commission on Dams, 2000).

**Review of Literature**

Saleh and Mondal (2001) evaluated the impact of Bakkhali and Idgaon rubber dam projects in Bangladesh. They examined hydraulic, agricultural and socio-economic factors of the dam in the area through field surveys. They found improved socio-economic indicators of the project and classified it a viable project. The crop yield and agricultural water productivity had improved in both projects however new area developed irrigated was very less as compare to the actual targets that were in primary plann. The actual water availability was much less than the targets as the same were overestimated in both projects during feasibility study stage. Pender and Berhanu (2002) investigated the impact of small irrigation schemes in Tigray in Northern Ethiopia. They observed significant improvement on agriculture sector due to these projects. They observed considerable increase in the use of agriculture inputs such as labor, fertilizer, improved seeds and others. The crop production had significantly improved. They found that crop production was 18% higher than in rainfed areas. Benin et al. (2002) also found similar results in a study in Amhara Region in Ethiopia. They observed increased use of agricultural inputs such as fertilizer, chemicals, improved seeds, pesticides, labor after development of small scale irrigation schemes. Maingi and Marsh (2002) studied dam construction along the Tana River, Kenya and research result showed that, this project impacted on the riverine forest and flood recession agricultural activities in the lower flood plain. Abdul Wajid and Usman (2013) in a study entitled socio economic impact of small dams on local vicinity have come that after construction of dam in the study area, the crop revenue has significantly increased. The traditional cropping pattern has been shifted to the market oriented crops while yield of almost every crop has been improved. The number of livestock has also been increased. The water table has improved and wells were recharged as before dam construction, people were facing acute shortages of water for domestic use (Abdul Wajid and Usman, 2013). Owusu, Namara, Kuwornu (2011) studied the impact of irrigation on the social welfare in the rural Savannah region of Ghana. Using propensity score matching (PSM) and switching regression techniques it was found that irrigation water availability had positively affected the socio-economic conditions of the people. The net farm income after irrigation water has shown significant increase. They strongly recommended construction of irrigation systems for poverty reduction in both regional and national level. In this paper was studied the effects of the Hana dam construction in Iran by use of Bayesian network method.

Tilt et al. (2009) noted that a dam’s construction may result in changes in the rural economy and employment structure, whereas also affects infrastructure and housing, non-material or cultural aspects of life and the migration and resettlement of people near the dam sites.

Ashraf, Kahlown and Ashfaq (2004) studied the impacts of Khasala, Jawa and Dhok Sanday Mar dams in Punjab. They found that after construction of these dams, the income, land use, crop intensities and crop yield of the farmers have been considerably increased. The cropping pattern has been shifted towards high valued market oriented crops. The water table has improved. The irrigation methods used were still conventional. They suggested that an integrated program should be developed and implemented in the command area of these dams for the effective utilization of available water and development of irrigation infrastructure. They contended that even more area can be irrigated with the same available water and infrastructure if it is managed properly. The results of study (Khalili and Zamani, 2009) showed that the farmers’ attitudes toward participation in irrigation management were dependent on: family size, problem perception, dependence on dam for water, and educational background. Moreover, based on farmers’ perspectives, unequal water distribution among farms, dissatisfaction with water authority operators, high water fees and charges were the main problems and obstacles toward farmer participation in irrigation management.

Malek Hosayni et al. (2017) invesigated the social impacts of dams on rural areas in Iran. The result of this research showed that in spite of the well-documented increase of agricultural income, according to the respondents, a significant change that followed the construction of dam was the generation of new employment opportunities.

Cheema and Bandaragoda (2007) studied the impact of of Mirwal and Shahpur small dams in Punjab, Pakistan. They found that in both dams there was no effective warabandi among the farmers. The existing warabandi was not followed by the farmers. The water conveyance network for both the dam was not properly maintained due to paucity of funds and manpower. The beds of canal were ruined and bushes were grown in cracks which impede water flow. It was observed that most of the areas under the command of these small dams were not leveled. The farmers were facing non availability of other agriculture inputs such as fertilizer, pesticide, good quality seed etc. At the end they suggested that Government should introduce an effective and justified warabandi system in the area, provide sufficient funds for operation and maintenance of the canal and provide other agriculture inputs at right time and low prices. Zakir and Muhammad (2004) studied the impact small scale irrigation on the agriculture productivity and poverty level of the farmers in the marginal areas of Punjab, Pakistan. They found that poverty level is high in rainfed areas as compared to irrigated areas. The poverty head counts were 26% in irrigated and irrigated plus rain-fed areas while it was 37% in the rainfed areas. The major portion of annual income of poor was from agriculture while for non-poor it was business. Similarly major portion of poor expenditure was on food. The agriculture productivity and profitability of the poor farmers is low as compare to the non-poor farmers, while the cost of production is higher of poor farmers as compare to nonpoor farmers. They found strong link in the increase of crop production due to small scale irrigation schemes, which will ultimately decrease poverty in the study area.

Khan et al. (2013) evaluated the impact of Mattani Aza Khel Dam on the crop revenues, agriculture practices and overall socio-economic conditions of the area. The result of research showed that after construction of dam in the study area, the crop revenue has significantly increased. The traditional cropping pattern has been shifted to the market oriented crops while yield of almost every crop has been improved. The number of livestock has also been increased. The water table has improved and wells were recharged as before dam construction, people were facing acute shortages of water for domestic use. This has reduced drudgery on the local inhabitants. Before dam these people had no proper source of income due to which they were primarily engaged in illegal practices, however, after dam they had started a new life as majority of the people has sufficient land for agriculture.

Many scholars (Esteves et al., 2012; Malek et al., 2017) note that the social, economic and ecological aspects and externalities of developmental interventions are underestimated in many cases. Hence, albeit ambitious, these projects often offer disappointing results, mainly due to the persistent focus on the economic dimension of rural development and overlooking ecological, cultural, and especially social consequences of these projects.

## MATERIALS AND METHODS

This study analysed the effects of construction the Hana dam for agricultural sector in Iran, from the attitudes of farmers. The main goals of this study, analysed the farmers attitude (resident in Hana County) the socio-economic and environmental effects of dam construction by use of the Bayesian modeling.

### Study Area

Isfahan Province is approximately 107,000 $km^2$ and covers at least 6% of the total land area of Iran (Figure 1). The average elevation of the province is 1500 m above sea level. The province consists of 52 hydrological units belonging to 9 basins and 27 sub-basins. Rivers are small and temporary, with the exception of the Zāyandarud, which totals 405 km in length, average annual precipitation of 450 mm, and a basin area of 27,100 $km^2$. Semirom County is a county in Isfahan Province in Iran. The county is subdivided into two districts: the Central District and Padena District. The county has four cities: Semirom, Komeh, Vanak, and Hana. Hana dam is located at the longitude of 51.7661765 and latitude of 31.2076116.

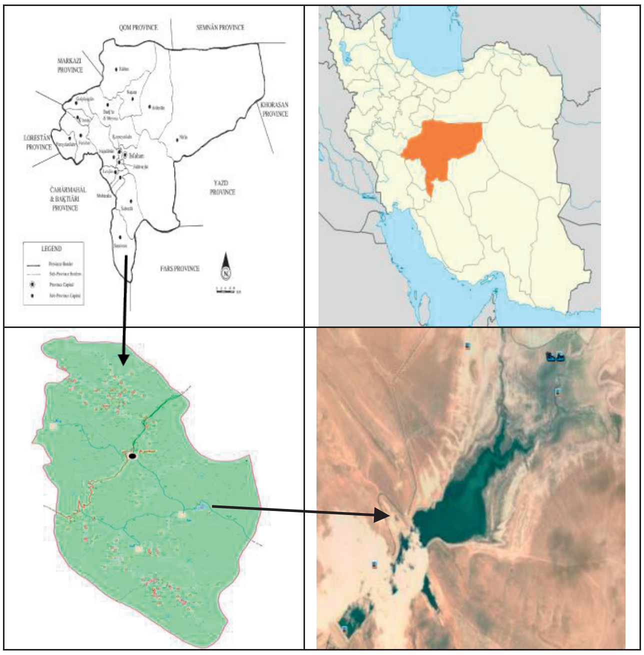

Figure 1. Geographical location of Hana dam

The beneficiaries of dam irrigation network were N = 1610 households that by using the Cochran formula, n = 210 samples were obtained and the necessary data was collected by using from questionnaires and interviews.

$$n = \frac{NZ^2pq}{Nd^2 + Z^2pq}$$

$$n = \frac{1610 \times (1.96)^2 \times (0.5) \times (0.5)}{1610 \times (0.63)^2 + 1610 \times (1.96)^2 \times (0.5) \times (0.5)} = 210$$

The validity of the questionnaires confirm from experts viewpoint and its reliability of the questionnaires calculated by using the Cronbach alpha coefficient assigned to the different parts of the questionnaires respectively: economical dimension 0.84 social dimension 0.71 and ecological dimension 0.75. Alpha value is in range 0 to 1 so that internal reliability of items is found through this coefficient. If this coefficient is zero, it will show full unreliability of items and if it is one, it will show full reliability. If alpha value is more than 0.7, questions and items are suitable for testing the concept or the related variable. According to Table 1 it is found that questions and items of the questionnaire is higher than 0.7. For this reason, it is scientifically valid to describe and test relations of variables. The respondents were asked to respond to statements regarding the Effects of the Hana dam construction. The statements were measured using a Likert-type scale (1-5). Descriptors for the scales were as follows: 1 = very low, 2 = low, middle = 3, high = 4, very high = 5. The respondents also answered some questions on the demographic characteristics. The period analysed in this study was 1990-2010.

The data, collected from Ministry of Agriculture and Rural Development, have been statistically processed and interpreted, building the trend line and setting up the forecast based on simulation models for the period 2012-2015.

Table 1. Reliability analysis (Alpha)

| Scale Name | No. of items in the scale | Alpha value |
|---|---|---|
| Economic factor | 28 | 0.846 |
| Social factor | 17 | 0.752 |
| Ecological factor | 17 | 0.712 |

The participants were asked to respond to a series of questions regarding the farm operations, activities at the farm, and comment on the general views regarding the Effects of the Hana dam construction. Name and type of measured variables are presented in Table 2.

To determine the befit of data and measure the homogeneity of variables that attracting farmers to group activities, the Kaiser-Meyer-Olkin (KMO) and Bartlett’s test measures were applied. These statistics show the extent to which the indicators of a construct belong to each other. KMO and Bartlett’s test got for these variables show that the data are proper for factor analysis as showed in Table 3.

KMO = 0.721 was got and because this value is larger than 0.5, it is concluded that the number of samples is suitable for factor analysis since KMO value is between 0 and 1 and the closer to one, the higher the sample validity. According to the above table, Bartlett’s test of sphericity was got to be 3419.047 with significance p = 0.000 and because this value is significant. The effects of this project have been evaluated by Bayesian networks. In this study for identifying Bayesian networks used the Netica software. To identifying and evaluating the effects of dam construction from the farmers viewpoint the variables classifed in ecological, economic and social dimanation. Also to get the Bayesian network, Netica Software was used.

Table 2. Name and type of measured variables

| Component | Variable name | Scale | Unit |
|---|---|---|---|
| Individual Characteristics | Age | Relative | 0-100 |
| | Gender (male=1, female=0) | Nominal | 0-1 |
| | Work Experience | Relative | 0-30 |
| | Level of Education (Illiterate=1, Under Diploma=2, Diploma=3, Degree=4, Master's degree or higher =5) | Ranking | 1-5 |
| | Family Members | Relative | 1-10 |
| Agronomic Characteristics | Land ownership (Owner=1, Rental=2, Sharing=3) | Nominal | 1-3 |
| | Acreage | Relative | 0-20 |
| | Average of Production | Relative | 0-100 |
| Economical Characteristics | Income (very low=1, low=2, middle=3, high=4, very high=5) | Ranking | 1-5 |
| | Occupation (very low=1, low=2, middle=3, high=4, very high=5) | Ranking | 1-5 |
| | New technology (very low=1, low=2, middle=3, high=4, very high=5) | Ranking | 1-5 |
| | Product diversification (very low=1, low=2, middle=3, high=4, very high=5) | Ranking | 1-5 |
| | Reduce unemployment (very low=1, low=2, middle=3, high=4, very high=5) | Ranking | 1-5 |
| | The rising cost of land (very low=1, low=2, middle=3, high=4, very high=5) | Ranking | 1-5 |
| | Public investment (very low=1, low=2, middle=3, high=4, very high=5) | Ranking | 1-5 |
| | Private investment (very low=1, low=2, middle=3, high=4, very high=5) | Ranking | 1-5 |
| Social Characteristics | Reducing migration (very low=1, low=2, middle=3, high=4, very high=5) | Ranking | 1-5 |
| | Partnership (very low=1, low=2, middle=3, high=4, very high=5) | Ranking | 1-5 |
| | Health services (very low=1, low=2, middle=3, high=4, very high=5) | Ranking | 1-5 |
| | Amenities (very low=1, low=2, middle=3, high=4, very high=5) | Ranking | 1-5 |
| | Access to agricultural services (very low=1, low=2, middle=3, high=4, very high=5) | Ranking | 1-5 |
| | The satisfaction of the dam (very low=1, low=2, middle=3, high=4, very high=5) | Ranking | 1-5 |
| | The impact of disputes (very low=1, low=2, middle=3, high=4, very high=5) | Ranking | 1-5 |
| | Create a sense of cooperation (very low=1, low=2, middle=3, high=4, very high=5) | Ranking | 1-5 |
| Ecological Characteristics | Increase the variety of fish and aquatic organisms(very low=1, low=2, middle=3, high=4, very high=5) | Ranking | 1-5 |
| | Increase the fish population (very low=1, low=2, middle=3, high=4, very high=5) | Ranking | 1-5 |
| | The entry of new species of plant (very low=1, low=2, middle=3, high=4, very high=5) | Ranking | 1-5 |
| | The entry of new species of animal (very low=1, low=2, middle=3, high=4, very high=5) | Ranking | 1-5 |
| | The increase in trafficking hunting (very low=1, low=2, middle=3, high=4, very high=5) | Ranking | 1-5 |
| | Enhance the beauty of the landscape (very low=1, low=2, middle=3, high=4, very high=5) | Ranking | 1-5 |
| | The impact of the drought (very low=1, low=2, middle=3, high=4, very high=5) | Ranking | 1-5 |
| | Impact on river discharge (very low=1, low=2, middle=3, high=4, very high=5) | Ranking | 1-5 |
| | Water pollution (very low=1, low=2, middle=3, high=4, very high=5) | Ranking | 1-5 |
| | Impact on sprigs and aqueducts discharge (very low=1, low=2, middle=3, high=4, very high=5) | Ranking | 1-5 |
| | Impact on well discharge (very low=1, low=2, middle=3, high=4, very high=5) | Ranking | 1-5 |

Table 3. KMO measure and Bartlett's test

| KMO | Bartlett's test of sphericity | |
|---|---|---|
| | Approx. chi- square | Sig |
| 0.721 | 3419.047 | 0.000 |

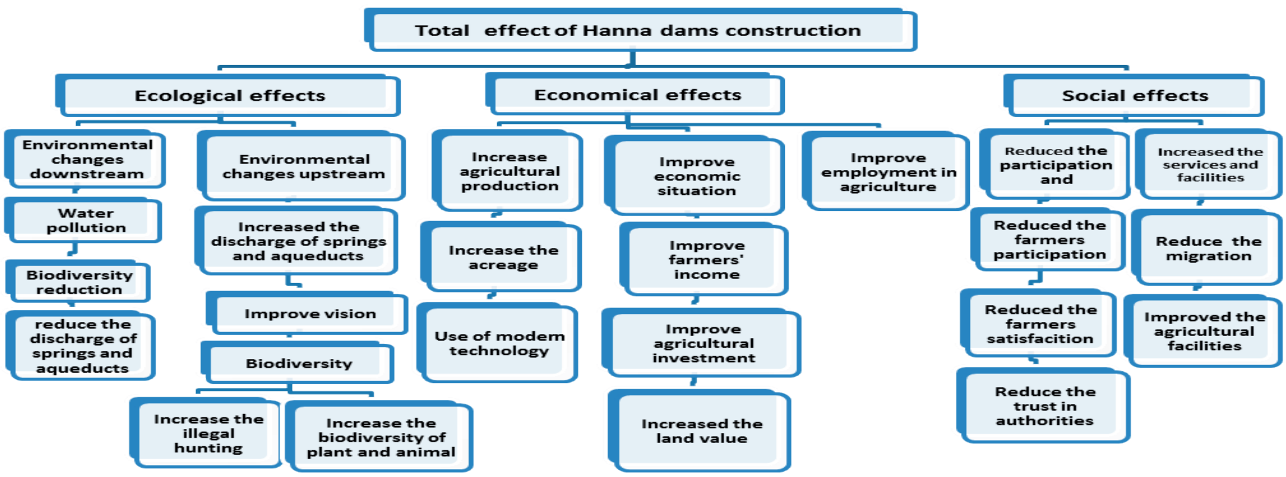

Figure 2. Economic, social and ecological impacts of dam construction in Hana County

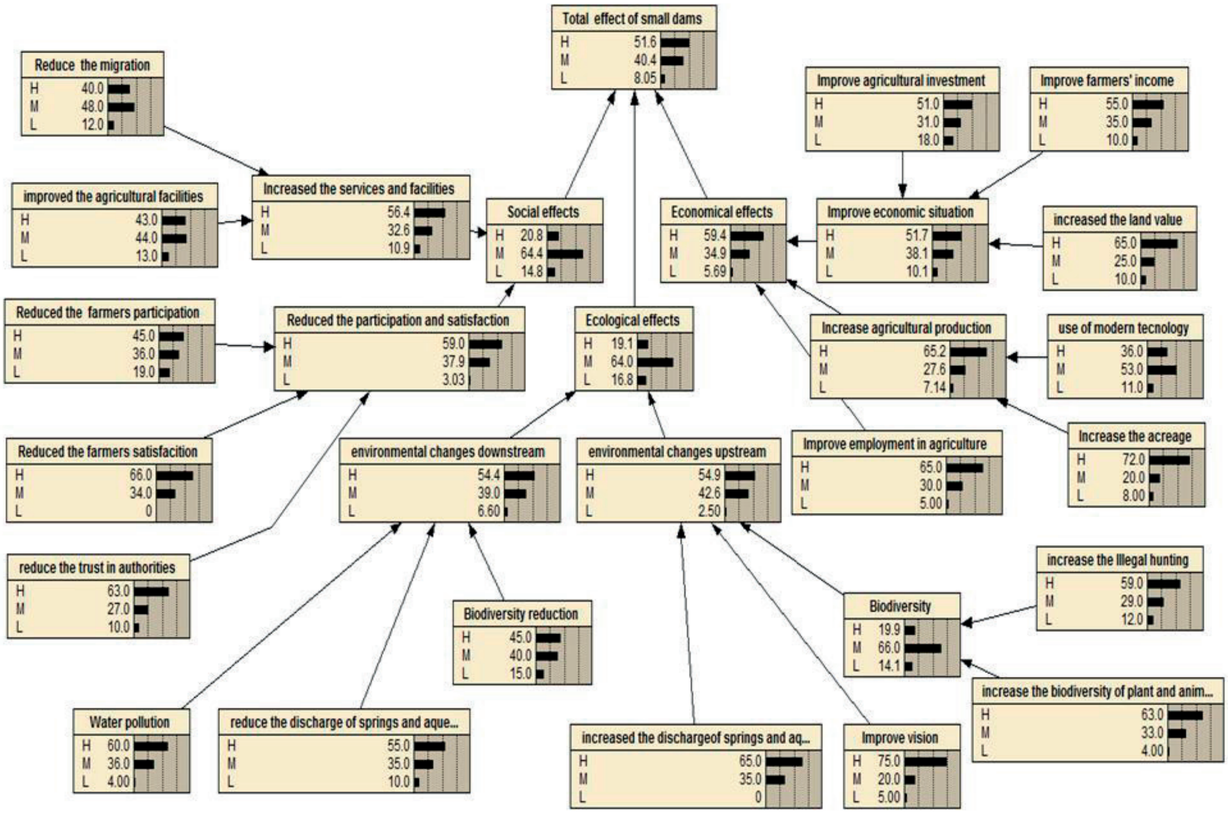


Figure 3. Bayesian model and Hana dam construction effects

**The Bayesian modeling**

A Bayesian Network is a directed acyclic graph consisting of a set of nodes and a set of directed arcs, which allows the representation of a complex causal chain linking events/actions to outcomes (Pearl, 2000). Bayesian method have a very advantage for socio- economic and ecological research for example: is parameter-free and the user input is not required, instead, prior distributions of the model offer a theoretically justifiable method for affecting the model construction, works with probabilities and can hence be expected to produce robust results with discrete data containing nominal and ordinal attributes, has no limit for minimum sample size, is able to analyze both linear and non-linear dependencies, assumes no multivariate normal model and allows prediction. Bayesian networks (BNs) are non-parametric statistical tools that rely on Bayesian inference to deduce the influence of explanatory variables on the outcomes of interest. A BN consists of two parts: First, a directed acyclic graph (DAG), also known as the structure of a BN, depicts interdependence among variables with directed arrows connecting nodes (corresponding to variables). The second component are conditional probability tables (CPTs), also known as parameters of a BN, which define the probability distributions of nodes conditioned upon the values of their parent nodes (where an arrow originates). The CPT of a child node (where an arrow ends) hence contains the conditional probability of being in a specific state, given the states of its parent node. When a node has no parent, the CPT is simply its prior probability distribution (Jensen, 2002; Pearl, 2009; Jens et al., 2013). The analysis stages based on Bayesian networks in this study were as follows:

1. Data parental input nodes of the Bayesian network were obtained via a questionnaire. Questionnaire data is collected from the farmers' point of view, the data were analyzed using SPSS software and have been entered to the Bayesian networks.
2. Data obtain entered on Bayesian networks in three categories: good (High), Medium (Medium) and bad (low) was divided and then enter the network.
3. The next step, Bayesian Networks to generate the child nodes should be completed by the conditional probability tables, that in this research, tables by using CPT calculator

software and confirmed by the relevant specialists were completed.

4. The final step, with completion all child nodes and implementation, the program was established.

## RESULTS AND DISCUSSIONS

Effects in three categories: good, average and bad are classified; the results show that most impacts in this region are in the middle class, with a value of 49.1%. The effects of Henna dam construction in three nodes: economical, social and ecological is listed in the Figure 4.

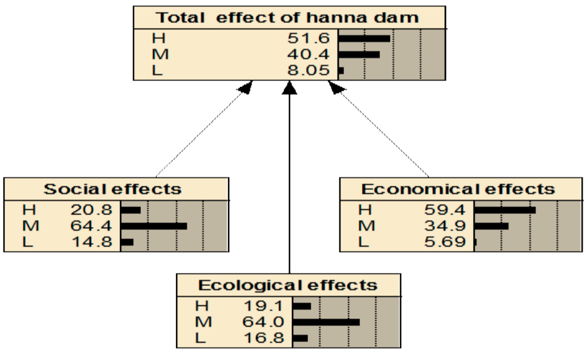


Figure 4. Effects of node social, economic and ecological on final nodes

The Bayesian networks create possibility the more detail effects of dam construction. Also can the effects be varied and complex nature of be summarized in a general framework without loss dynamics effects. In this method the effects procedure is schematically and is suitable for decision. The main purpose is specify using form view farmers' that of what has impact the most affect. With use of Netica software constituted Bayesian network, all effects such as (economic, social and ecological) of Hana dam identified and the relationships between this effects has investigated (Figure 3).

Bayesian network were categorized this effects in three branches high, medium and low. The overall results of this study showed that the total effects of Hana dam could be summarized in good (51.6%), medium (40.4%) and low (8.05%) levels respectively (Figure 4).

The result of research showed that in economic node whit little value (0.13945) has the more effects on the final nods. The social nodes with little value (0.13574) there is in the next rank. Ecological node as the third factor has a significant effect on the final nods with little value (0.00783). Therefore the result showed that the economic and social nodes have the positive effect but ecological nodes have the negative effects in Hana areas (Table 4).

Table 4. Parameters of Hana dam construction effects

| Parameters of Hanna dam construction effects | Effects | Little value |
|---|---|---|
| Economical Effect | Positive | 0.13945 |
| Social Effect | Positive | 0.13574 |
| Ecological Effect | Negative | 0.00783 |

Quantitative factors influencing the economic parameters included: improve farmers' income (0.24678), improve agricultural investment (0.09820), improve employment in agriculture (0.06153), increase agricultural production (0.04400), use of modern technology (0.01319), increased the land value (0.01147) and increase the acreage (0.01042), respectively (Table 5).

Table 5. Quantitative factors influencing the economic parameters

| Economic parameters | Effects | Little value |
|---|---|---|
| Improve farmers' income | Positive | 0.24678 |
| Improve agricultural investment | Positive | 0.09820 |
| Improve employment in agriculture | Positive | 0.06153 |
| Increase agricultural production | Positive | 0.04400 |
| Use of modern technology | Positive | 0.01319 |
| Increased the land value | Positive | 0.01147 |
| Increase the acreage | Positive | 0.01042 |

The all effects that loaded in economic parameters were positive effects. These strategies have been considered in the context of regional income. In fact quantitative values of economic parameter showed that the Hanna dam has positive effects to areas development and this project could be help to manager to decision maker's management actions.

Quantitative factors influencing the ecological parameters included: increase biological variation in upstream of the dam (0.33466), decrease biological variation in downstream of the dam (0.25778), increased the discharge of springs and aqueducts (0.04313), increase the biodiversity of plant and animal in upstream of the dam (0.03476), decrease the biodiversity of plant and animal in downstream of the dam (0.01679), increase the illegal hunting in downstream of the dam (0.01202), water pollution in downstream of the dam (0.01148), improve vision (0.01105) and reduce the discharge of springs and aqueducts in downstream of the dam (0.00548), respectively (Table 6). The effects that loaded in ecological parameters were positive and negative effects.

Table 6. Quantitative factors influencing the ecological parameters

| Ecological parameters | Effects | Little value |
|---|---|---|
| Increase biological variation in upstream of the dam | Positive | 0.33466 |
| Decrease biological variation in downstream of the dam | Negative | 0.25778 |
| Increased the discharge of springs and aqueducts | Positive | 0.04313 |
| Increase the biodiversity of plant and animal in upstream of the dam | Positive | 0.03476 |
| Decrease the biodiversity of plant and animal in downstream of the dam | Negative | 0.01679 |
| Increase the illegal hunting in downstream of the dam | Negative | 0.01202 |
| Water pollution in downstream of the dam | Negative | 0.01148 |
| Improve vision | Positive | 0.01105 |
| Reduce the discharge of springs and aqueducts in downstream of the dam | Negative | 0.00548 |

Quantitative factors influencing the social parameters included: Reduced the farmers satisfaction (0.03391), increased the services and facilities (0.26189), reduce the migration (0.07004), reduce the trust in authorities (0.03345) and reduced the farmers participation (0.00749), respectively (Table 7).

Table 7. Quantitative factors influencing the social parameters

| Social parameters | Effects | Little value |
|---|---|---|
| Reduced the farmers satisfaction | Negative | 0.03391 |
| Increased the services and facilities | Positive | 0.26189 |
| Reduce the migration | Positive | 0.07004 |
| Reduce the trust in authorities | Negative | 0.03345 |
| Reduced the farmers participation | Negative | 0.00749 |

The effects that loaded in social parameters were positive and negative effects. In this study the effects investigated in three categories: good, average and bad are classified. The results showed that the most important impacts in this region are in the good class, with a value of 51.6%. The results of the sensitivity analysis showed that the final node represents that, economic impact, social effects, and ecological effects respectively have highly impact on final impacts. The result of research showed that in economic node whit little value (0.13945) has the more effects on the final nods. The social nodes with little value (0.13574) there is in the next rank and also the ecological node as the third factor has a significant effect on the final nods with little value (0.00783). The results of the sensitivity analysis showed that the economic nodes have the positive effect but ecological and social nodes have the positive and negative effects in Hana areas. Also the results showed that in the economic impacts construction of Hana dam in the area; improve farmers' income with a little value of 0. 24678 as the most influential was parameter in the Bayesian model.

## CONCLUSIONS

Although the benefits of dam construction are numerous, particularly in the context of climate change and growing global demand for electricity, recent experience has shown that many dams have serious negative environmental, human, and political consequences. During the construction of the dam, many local workers were occupied in different fields giving a tonic effect in the local economy. However, most importantly, the nonagricultural economic activity gained momentum after dam construction, mainly due to the development of tourism in the region. In addition, alternative employment opportunities such as hose works have also emerged in the region, contributing thus to a significant reduction of unemployment and expansion of the economic domain. In the social impact parameter, increased the services and facilities for Hana areas with amount little value 0.26189 is most important parameter in this parameter. Especially regarding the construction of dams, several paradigms confirm that such projects are sometimes accompanied by negative social impacts (Srinivasan, 2001; Tilt et al., 2009; Beck et al., 2012). The final quantitative values obtained in ecological showed that increase biological variation in upstream of the dam and decrease biological variation in downstream of the dam respectively with quantitative values 0.33466 and 0.25778 as the most important parameters affecting the ecological impacts of dam construction in the this region. To other way the result of this research showed that the all effects that loaded in economic parameters were positive effects. These strategies have been considered in the context of regional income. In fact quantitative values of economic parameter showed that the Hanna dam has positive effects to areas development and this project could be help to manager to decision maker's management actions. But the quantitative values of ecological and social parameters were positive and negative. To other way ecological and social parameter showed that the Hana dam has positive and negative effects to areas sustainable development and this project could be help to manager to decision maker's management actions. In economic effects the Bayesian network identifies the significant effects related to: improve the agricultural investment, improve farmer's income, improve the employment, increased the land value, increase the acreage and increase the agricultural production. Also in social effects the Bayesian network identify the significant effects related to: reduce the farmers participation and increase to access in agricultural services. So in ecological effects the Bayesian network identify the significant effects related to: Increase the plant and animal biodiversity and increase the discharge of springs and aqueducts.

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