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Importance of Hamoon Lake on Rural Development in Sistan Region

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Abstract The importance of lakes in maintaining agriculture, job and income creation, prevention of poverty and unemployment, and finally to decrease rural emigration has made lake conservation inevitable. The present study , carried out in 2011, has aimed at investigation of devoting still alive Hamoon water to agriculture sector and its role on the rural population remaining. Furthermore analyzing immigration trend and population composition of Zabol (a fronter-situated city in southeast of Iran). Using linear (LP) and goal programming (GP) approaches with the aim of pertaining current employment level of local users of the area "Shib-E-Ab" and minimizing water consumption in shortage months (June, July and May), the optimal culturing pattern is proposed. On the other hand, it analyses the share of other income groups of Hamoon lake regional residents (including fish harvesters, bird hunters and livestock farmers) in Hamoon-resulted employment and income. In fact, this research is expressing the role of live Hamoon in agriculture maintenance, job and income creation and keeping of residents. The results suggests the negative effect of drought on keeping of residents and subsequently increasing of emigrants and growth of Afghani's (Afaghana) population. The present culturing pattern is not optimum, so that its water demand exceeds water supply in majority of months. Therefore, using proposed pattern in addition to maintaining employment level and water limitations can achieve a higher income for local residents. Furthermore, living Hamoon may cause maintaining occupation of other its users (fishermen, harvesters, bird hunters and livestock farmers), at the levels of 18524, 9430 and 1032 households respectively by moving from watery Hamoon to dry Hamoon. Finally, some strategies are proposed to improve these regional conditions.

Keywords Drought, Migration, Optimal Pattern, Residence, Sistan

1. Introduction

Iran is considered as one of the driest areas in the world. The most of parts of Iran plateau is desert. Most regions of Iran (except the north-western provinces and southern shores of the Caspian Sea), have only 150 to 250 mm rainfall per year(8) These figures show that average rainfall in Iran is less than 30 percent of the global rainfall.Other problems such as disproportionate geographical distribution of rainfall, high evaporation rate and extent of changes in annual rainfall, have made this issue far more serious. Water scarcity in one hand and enormous cost of water supply, have changed increase of efficient use of water into one of the most important national concern. Referring back to scarcity of water , mentioned above, other factors such as population growth and improving living standards will intensify the competition for this scarce resource. Rapid population growth and increasing need for food and nutritions have absorbed the authorities and the governments' attention towards the agriculture sector. In our country in which most areas have arid and semi– arid climate, water is not enough for various uses, especially agricultural products irrigation. Currently, due to lack of sufficient water, crop production have decreased considerably.

Rainfall reduction in many parts of the country, following with depletion of the groundwater aquifers and water limitation, has led the agricultural activities to shortage of the required revenue , This paper analyzes the cessation of agricultural activities by farmers and studiesthe possible reasons for migrating into the other areas of the arid regions where there is money to survive. Increased immigration has created many problems for the region and the whole country. This immigration has first created the problem of over population in some regions ,and second with farmers leaving the land has provided suitable opportunities for non-native people in the area.

So water is the limiting factor for agricultural development. In addition, about 90 percent of water consumption is allocated to agriculture. So, the proper management of water with the optimal allocation of inputs seems to be very important. Efficient use of water mostly

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depends on the scarcity of water and in order to manage that, proper economic principles should be applied.(2)

2. Objectives

The objectives of this research are:

1- Recognition of the Hamoon lake during floods for creating more job- opportunities and income for people in different occupational groups.

2- Optimal allocation of Hamoon lake water to agriculture to maintain the existing employment level.

3– Determination of optimum cultivation model with regard to water restrictions and maintain employment in the region.

3. Methodology

Improper optimal allocation of water leads to increasing immigration of people to other regions with the assumption that Area cultivation pattern is not optimal.

In order to study the agriculture of the region and provide an optimal model for cultivation and illustrate Hamoon's abilities in creating jobs and income for the residents on the bank of Hamoon Lake (located in the shib-E-Ab) , the researcher has collected the required data via interviewing the civil consultant engineers present on the site and a questionair filled up with the settlers on the region Sampling methos used in this research is also a two- phase random questionnaire. In this study,two types of questionnaire have been used so that in order to gain access to the agricultural information of the region and to provide optimal cultivation model, several interviews have been performed with for 100 farmers in 25 villages of the region. Next, in order to show the constant ability in making a living, employment and income and ultimately the high possibility of people's settlement on Hamoon's banks , 180 questionnaires were completed, and the general statistics and information were also received from the related organizations. The Linear Programming model (LP) has been used in this investigation to provide optimal model cultivation in the region. Simultaneously, in order to achieve their goals, the Goal Programming (GP) has been applied for keeping employment level in the region and in the agricultural sector with regard to the least amount of the water consumption in the year due to a lack of water in near furure. In another part of the research, we will portray the ability of still- alive of Hammon lake in preserving settlement of other groups of people (Fishermen, bird hunters, and livestock farmers).

4. Water Resourses Development

Development of water resources have always been considered important in countries with arid and semi-arid climatic conditions. The purpose of this study is to analayze the implementation of these programs for increasing agricultural production plus an increase in the national production and income. So, the development of water and soil, and the cultivation model designed to determine meaning levels under cultivation, have had a special importance and should be performed in a way that the optimal use of existing and accessible capacities and forms meet an accountable part of regional and national needs. The investments in the implementation of the water supply will be barren unless we achieve the goals of transmission and distribution of water in the field and eventually agricultural production increase; otherwise. it may cause several new problems in some cases. Therefore, for solving such programs we do require the multilateral environments and the thorough analysis of the proposed solutions to achieve the proper remedies and eventually choose the most favorable solution.

The purpose of the Cultivation model is the most controversial issue in recent studies. First, the estimates should be enforced to suit and correct the integration of all the potential limitations and needs of the region. Second, the cultivation model in development studies of water resources, on the basis of the programming for water resources and the other side the incomes of its economic justification based on the costs of the water facilities which is designing based on their needs to allocate water cultivation model. In other words, cultivation model program linking the shallow Water Resources and agricultural development and design in its development programs has a special delicacy in water resources and soil that does not respond to any effective factors which are believed to create disorder in the program.

As far as the potential sources are various and because of the biological features, number of arts in methods of production, potential facilities and resources are in fact numerous. Normally, number of programs that could be used for utilization of land and water development of the existing drew up is quite high. Therefore, it is necessary in this regard to consider appropriate priority to this issue. On the basis for determining water need of one hectare in the proposed model, i. e. Nidro model,those factors such as water consumption in a month consumption and also proportionate water consumption and of a river in the month have a great importance.

Programming the purpose about the systems that have numerous and multiple goals, also has been presented. Methods presented under the title of "Planning Definite Goal" have common features: all of them are at least the most unfavorable deviations from the goals. In this regard for beginning the issue, Standard model (Ignazio) will be mentioned:

5. Model Specification

Minimize:

$$Z=\begin{bmatrix} p_1(d^-,d^+), p_2(d^-,d^+,....,\\ p_k(d^-,d^+,...., p_k(d^-,d^+) \end{bmatrix}$$

Subject to:

$$f_i(x) + d_i^- - d_i^+ = b_i$$
$$x, d_i^+, d_i^+ \geq 0$$
$$d_i^-, d_i^+ = 0$$

That:

Z: utilization is still holding the priorities

X: utilization of decision variables

d_i^-, d_i^+ Positive and negative deviation of I th goal

$p_k(d^-, d^+)$ is linear function of deviance variables of the given weight to a K[th] of priority surface which is shown as follows :

$$p_k(d^-, d^+) = {}^m{}_{i=1}(w_{ik}.d_{ik} + d_{ik}^+, w_{ik}^+),$$
$$w_{ik}^-, w_{ik}^+, d_{ik}^+, d_{ik}^- \geq 0$$

K= 1, 2…k, k<=m

That Kith priority factor (p_{ike}) with common goals in a group they will be defined and p_k has below equation:

$P_1>P_2>P_3>….>P_K$

This relation shows that priority goals with higher levels (P 1) are optimal, of course before selecting of the priority goals with lower levels (P 2) and if it is possible to reach a goal, the goal in the lower priority should be sacrificed.

W_{IK}^-, W_{IK}^+ The numerical value (weights) that the d_{ik}^- and d_{ik}^+ deviance variables are referred to a p_k level.

Criterion that should be used in determining the weight of deviance variables. Minimizing the opportunity cost is lost. It means that opportunity cost coefficients that is always positive must be related with an agent of Wt unit:

F (x) is a linear function of deviance variables in ith level goal.

Bi is a favorable goal level from ith Goal.

The following sections refer to some studies about the use of the programming. A research done by T. Rehman and C.Romero of Cordoba Reading Universities in England with the goal of programming the standards and many decision-making processes and in designing fields is an analysis in a commentary published in 1987.

In this research, both Linear Programming model and Goal programming model have been implemented in order to determine cultivation optimal model in a garden unit, including planting two crops, first with model of programming and second with Linear Programming in order to achieve many various goals. Goal function is maximizing the Net present value (NPV) and limitations of the models include the limitation of the investment for 4 years, facing with the limitations of the labor force, machinery and so on. Final results model offers several soluations by using the Linear Programming model devoted to 44/4 hectares of land to the peach garden and 5 hectares to pear garden.

The research done by D. M. Sharp and F. Njiti involves a planning management route with competitive goal for using in Cameroon areas during 1986-1981 and 1991-1986.

In this research, the weight goal programming model has been used for allocation to the earth to the four activities: animal husbandry, forest, agriculture and pasture in different areas of Cameron. General form model has been used in this research is as follows:

Minimize z= $\sum_{i=1}^{n}(w_i^+ d_i^+ + w_i^- d_i^-)$

Subject to:

$$AX + Id^- - Id^+ = G$$
$$BX(\leq \equiv \geq)C$$
$$X_j \geq 0(j = 1, 2, ..., m)$$
$$d_i^+, d_i^- \leq 0(i = 1, 2, ..., m)$$

w_i^+ And w_i^- = different numbers (weights) that deviance variables give to di and di.

A = matrix (n.m) that the connection shows between the decision variables vector (m. 1) and the goal vector (n. 1).

B = a matrix (c.m) of coefficients that relates with decision variables in restrictions vector (c.1).

N= numbers of goals c = numbers of restrictions z = value of goal function

M = the numbers of decision variables

The above- mentioned equations have been used in model solved with the following equation.

Minimize

$$z = w_i^+ d_i^+ - w_i^- d_i^- + w_2^+ d_2^+ + w_2^- d_2^- + w_3^+ d_3^+$$
$$+ w_3^- d_3^- + w_4^+ d_4^+ + w_4^- d_4^- + w_5^+ d_5^+ + w_5^- d_5^- + 0d_1^+$$
$$+ 0d_1^- + 0d_2^+ + 7d_2^+ + 5d_3^- + 0d_4^+ + 6d_4^- + 3d_5^+$$

A research has been done By D.Barnett , B.Black , B.A.Mc Carl with the subject of goal programming through multi -scale on Senegal fields in 1982 . In this investigation , a weight goal planning model has been used by ranking goals in order to achieve their different goals in many living fields of Senegal. The main role of this survey is maximizing profits in these fields and this task is the function of the other limitations, including:

a) Production of sufficient food for all people even if it's not the proper time for that seasonal crops.

b) Lower consumption qualities (including annual loans for installing equipment, fertilizer, and seed

c) earning more income in order to buy animals

d) Organizing work for leisure.

e) Getting more products by more investment on consumption

This model was used by two methods, first only to maximize the benefit earned from Linear Programming model and then the programming model with multipling up the goals in order to determine the optimal model cultivation. Economic Evaluating of the results achieved from thses two models for planning and linear programming shows that the planning model is better allocated to Linear Programming model which is applied on the earth.

The research done by A. Singh in 1993 is about designing land usage to use the rainy irrigation system of programming with the use of information system.

In this investigation, a goal programming model has been used for making optimal allocation for rainy irrigation in different levels and land usage in order to maximize the production of all demanded products .The restrictions include the amount of erosion, the amount of the cultivated land and the available budget.

Final reply model shows that only a little amount of energy demands, proteins, employment and water, can be achieved inspite of the limitations of the allocated land to agriculture.

6. Results and Conclusions

6.1. Hamoon Wetland: Opportunities and Threats

Evaluating of the lakes is important in various aspects, so with the aid of these people, it has a special position in any society. The lakes are valuable in providing goods, services and different characteristics that give them four main roles: regulating, carrying, manufacturing and informative roles. To provide assistance to the lakes is a regulatory role .One of the roles of the regulatory help is to protect lakes-human and to create jobs and income and to prevent the immigration of the residents to the father lakebands. Necessity of evaluating of this role of the damages was imposed inevitably for the recent seven year (1384-1378), in the region of Sistan. The drought threat to the increase in immigration , i.e., "a large percentage of villagers residing in the regions located in Posht-E-Ab and Shib-E-Ab, to other regions of the province or country, the increase of unemployment and poverty in the region and above all, the increase in immigrating Afghans from Afghanistan and their settlement in these regions and the danger of deporting the native residents from this part of Sistan, are some factors known to the Sistani villagers and the Afghans whose property is registered with their names in the area. Because of these reasons , Hamoon lake introduces an agent that can create employment opportunities and higher income for the residents of Hamoon lakes margin provided that there is enough water, and also a rich source that can prevent local people of the region from immigration . It also has play the first role in this regard. . On the other hand, arid Hamoon can play a completely contradictory role. In this time, the Hamoon lake in the times that Hamoon lake could be facing a completely unique opportunity to create jobs and income for a lot of people, now in the drought Times it was as a serious threat in forcing people to leave the region and abandon their lands. So in the first stage of Hamoon Lake water allocated to the agriculture sector it mostly presented the optimal cultivation model to be used in the higher shib-E-Ab section, with access to the same time goals to at least maintain employment in agriculture sector and reduce water consumption. With the aim of accessing to these goals, proposed cultivation model was used to show the benefit of the increase in cultivating onions, cumin, saffron in the cases that the water we had shortage (Khordad, Tir), The first reason of increase on cultivation onions land is that less water is used for onions in these two months, and secondly it is a fact that due to the usage of onions in the work force and the other hand surplus labor force in the two months of cultivation, onion has been recommended. cumin, saffron also is planted for the high profit in acres of land and less water which is needed in the two months, i.e., when the areas under cultivation for these two months have increased. The price of water in these two months was calculated 253 and 313 Rials. Because of the recent study on the importance of Hamoon lake on durability groups: fish harvesters, bird hunters and livestock farmers living on the sidelines of Hamoon lake, evaluating the number of wrecked that in three position , watery , arid and semi-arid of Hamoon lake, sustenance from Hamoon , and Hamoon living their durability, these factors have been discussed in a way that the resulting observations show that in the best conditions, when every three Hamoons were totally watery is the best situation in which the volume of water in Hamoon is to about 2 billion cubic meters. There are 18,524 families living around Hamoon who their income totally gained through Hamoon . The number of households are constituted equals 8/40 percent of Sistan households; in other words, half of the Sistan households in this position of Hamoon, on sustenance by Hamoon , from these 8/40 percent, 8/6 percent of them were engaged to fishing activities, 2/8 percent of them received their living through hunting birds, 1/4 percent of them provided their money from grass and straw and 3/25 percent of them through ranchers and farmers around Hamoon that ranchers received their share from Hamoon through the pressed and scatterred pasturage around Hamoon and the use of meat and selling it and also farmers through the use of Hamoon water and near Hamoon, in favor of Hamoon. So in this situation the durability for half of the people was to Sisitan in the lake in the villages around Hamoon guarantee. So it can be said that in this situation Hamoon not only earns sustenance for half of the population of Sistan, but also when the security viewpoint durability half of the population of Sistan by Hamoon to this lake importance of Hamoon security also becomes clear. On the opposite hand, in this situation, we have lots of dry lands when the creation of employment and income for the residents of Sistan, the number of wrecked that poorly paid 100 percent of Hamoon is provided for less than 1032 families. This number is equivalent with 3/2 percent of Sistan's people. This situation is related to a state of Hamoons that Hamoons going to arid and only holes in Hamoon have lots of water. This situation when Hamun are vivid in terms of being in a situation is middle class and the amount of water in the Hamoon 700 to 800 million cubic meters. The number wrecked that poorly paid 100 percent of Hamoon is provided to about 9430 families, in other words this time in 20 percent households Sistani appropriated 100 percent of the Hamoon. Of these numbers of families, 6/4 percent of them are engaged in fishing activities, one percent of them providing their sustenance from Hamoon through

hunting birds, 3 percent of these families from grasses and strew, and selling them the appropriated by the Hamoon and eventually 12/2 percent of them farmers and livestock farmers around Hamoon, the proportion of their profession completely provided from Hamoon . The articles have represented that they understand the movement from watery Hamoon toward a dry Hamoon, to what extent job security in a region (in the loss of income and employment) and finally the national security in a country (the immigration in the region and abandon their lands) are endangered.

7. Recommendations

With regard to the results of the study, the purpose of the implementation of a policy in the agriculture sector of Sistan region is only proposed with the optimal cultivation model to farmers regarding the water, onion products, alfalfa, cumin, saffron to be used in the optimal model proposal. But if the goal is to keep employment level of users in the region, and at least in the present situation, it will reduce water consumption in the months that lack water, so those products such as onions, cumin, saffron were applied in optimal model.

By knowing Hamoon Lake as the only wetland of Sistan region, which can also be a factor in creating jobs and income, removal of poverty and unemployment and maintaining durability and people in the region, it will be offered to hypostatize the situation of the lake water and to protect ecosystems region to be preserved. Proposing those negotiations between Iran and Afghanistan officials will be continued to negotiate and implement the contract Hirmand rationing water that will increase the share and its resistance to Iran.

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