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Reclamation of saline soil using subsurface drainage system, Golestan region, Iran.

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Introduction

Evidences indicate that due to growing in the population of world, the amount of demands for agricultural products are yearly increasing. On the other hand, in order to sustain and increase agricultural products and ensure to achieve food security, it is necessary to improve and develop healthy and fertile soils. For this purposes, more efforts need to preserve and sustain important components and valuable area. Numerous investigations and studies indicate that the salinity level of land is expanding and increasing, and this process can be considered a serious threat to the country's food security. In Iran, although a significant area of the country's land suffer from saline, especially in the north of Iran due to the high level of underground water or in some cases waterlogging and ponding agricultural lands are highly exposed to destruction and the crop is facing a decrease. In a case study, reclamation of saline soils in the north of Iran was implemented using surface and underground drainage systems.

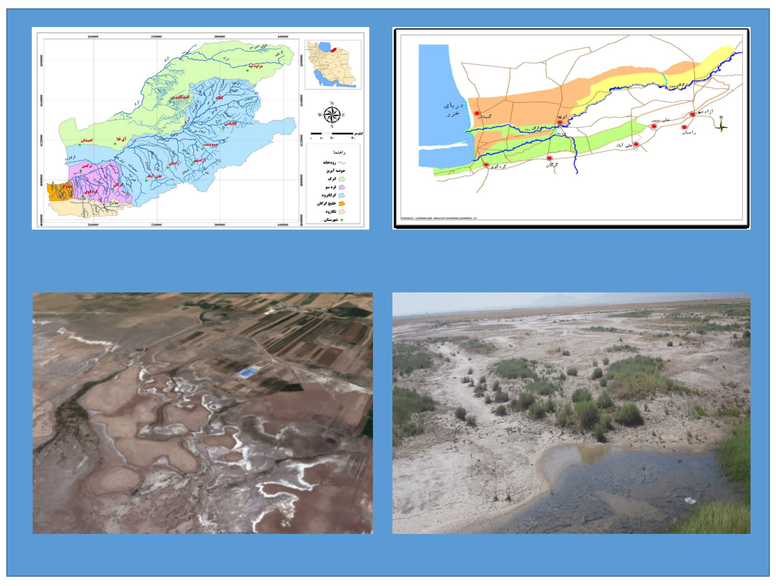

Figure 1: study area (up maps) and expansion of soil salinity on crop land (down pictures).

Methodology

surface and subsurface drainage system were designed to implement using a numerical model named Modflow in combination with GIS, and experimental method. Suitable scenario was selected to implement in order to achieve the expected results. To evaluate the performance of the project, samples were taken monthly from the drainage water and surface soil at a depth of 30 cm and were analyzed in the laboratory. In addition, the rate of agricultural yield and efficiency were investigated and evaluated considering to kind of crops during two years.

Table 1: Increase in agricultural crop due to reduction in soil salinity level.

crop	before(ton/ha)	After (ton/ha)	increase
Wheat	0.5	1.5	1
Wheat	0.7	2	1.3
barley	0.6	2.5	1.9
barley	0.8	2.5	1.7

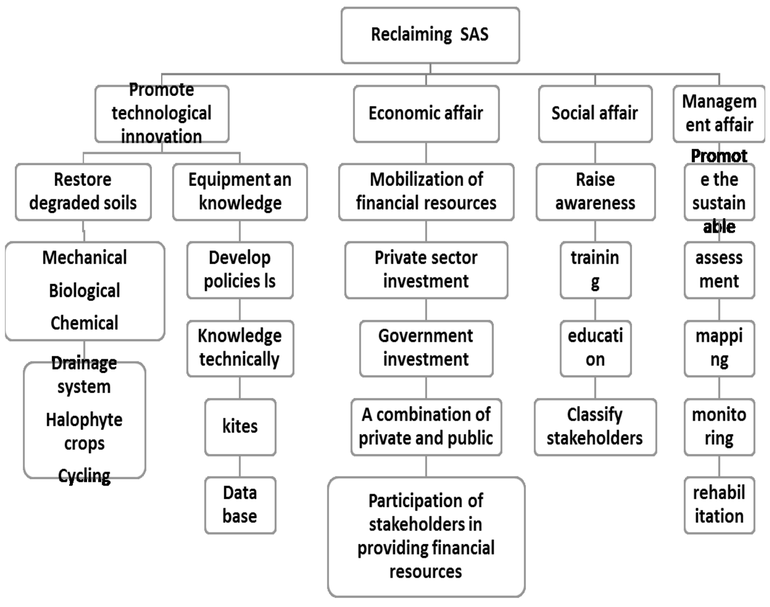

Figure 2: diagram of management and improvement of saline soils

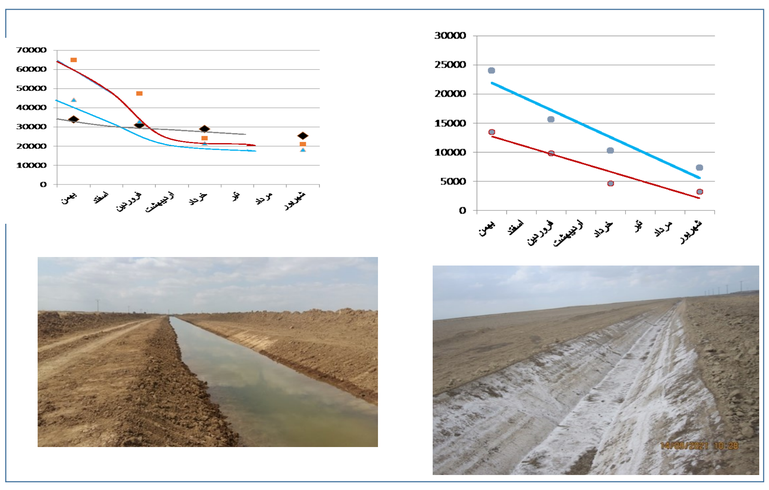

Figure 3: Lowering salinity level in drainage water(Left)
Lowering salinity level in soil profile(Right)

Results and Discussion

Results demonstrated that the salinity level of water and soil has significantly decreased in a range of 50 to 70 percent during a year. In another survey, it indicated that with the implementation of the drainage system, the amount of wheat products significantly increased from 500 kg/hectare to 2500 kg/hectare annually. Therefore, the implementation of the drainage system can not only prevent the spread of soil salinity, but also protect the agricultural lands of the region from the progress of salinization. Beside the decrease in soil salinity, the crop productions were increased. Cycling of drainage water after a period of desalination is one of the other steps of the project that has been experienced in this project and can be used for irrigation.

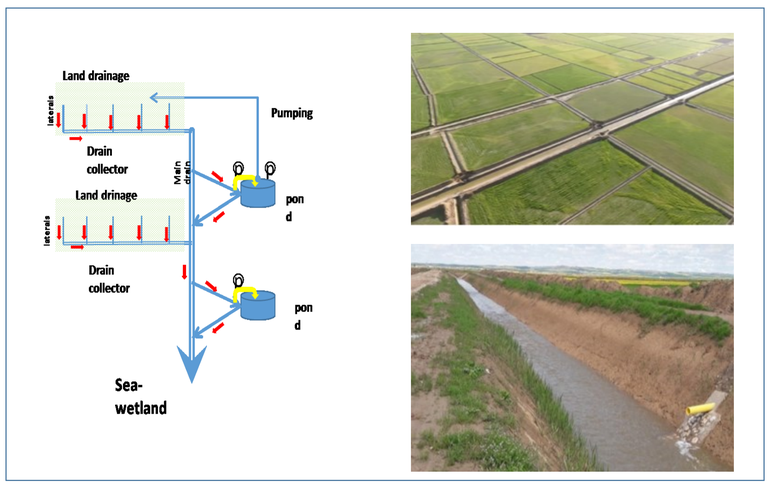

Figure 4: Drained lands (right) and the drainage water recycling system model (left)

Conclusions

Salinization the salinity level of water and soil have significantly decreased in a range of 50 to 70 percent during a year due to install subsurface drainage system . in addition, wheat products meaningfully increased from 500 kg/hectare to 2500 kg/hectare yearly. Therefore, the implementation of the drainage system can not only prevent the spread of soil salinity, but also protect the agricultural lands of the region from the progress of salinization. Therefore Salinization is a serious problem so that is rapidly growing as a consequence of human activities. It is necessary to reclaim the salt-affected soil due to the limited land for cultivation. For this purpose need to prepare and complete a strong and comprehensive database on salinity at the national and international level.

Refrences

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2.Ghorbani, Karim, Aimrun Wayayok, Ahmad Fikri, and Masoumeh Abbaszadeh. "Investigation of salinity consequences resulting from drainage systems using numerical models." *Journal of Irrigation and Drainage Engineering* 143, no. 5 (2017): 05017001.

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International Network of Salt-Affected Soils

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