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APPLICATION ANALYSIS OF SEAWATER DESALINATION AND DRIP IRRIGATION SYSTEM BASED ON RENEWABLE ENERGY

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Abstract

Wind energy was used in the process of pumping water from the sea to be treated and also used to pump water and raise it in large reservoirs for use in agriculture, the renewable energy of both sources (solar and wind energy) was stored in batteries for household, electrical, lighting and other purposes. In the current research study of the possibility of using renewable energy (solar and wind energy), the solar light was used to treat salty sea water and to produce water with different degrees of salinity.

Desalination plant used shallow and Deep Wells water resources were constructed at Sunite Left Banner district and sea Water from Hexigten Banner district, Inner Mongolia, China, the drip irrigation system was used by automatic control using electric energy from these batteries. The use of electrical energy from these batteries and solar energy was used significantly in the operation of the valves of the drip irrigation system in these experiments in the region of the automatic system. It can be recommended to use renewable energy in its sources (sun and wind), in all purposes in order to develop remote and remote areas that need equipment and costs are very large to develop now. For the production and quality of grain crops and a significant saving in traditional energy sources. It can be recommended to use renewable energy (solar and wind energy) because it is prepared to provide large amounts of energy and also use the subsurface irrigation system with a depth of 25 cm with both water salinity 70% or 100% of fresh water for non-significant difference between them and led to higher productivity For grain yield and straw for wheat and higher water productivity.

Keywords: Desalination, Solar, Wind, Water pumping, Drip irrigation, Water productivity.

Introduction

The rays from the sun and the heat and light they carry with them are a source of solar energy. They are exploited by humans in their interests and harnessed by technological means and techniques. The sun can be harnessed to generate thermal and electric power. Electric energy can be generated through solar energy using thermal motors, photo-voltaic panels, and photovoltaic converters. Solar energy was used in the prehistoric era, when monks used the gilded surfaces to ignite the scale of the altar. In 212 BC. Archimedes burned the Roman fleet by exposing the sun from a distance, using reflective mirrors, (Sitranon et al, 2015). In 1888, Weston came up with a way to convert solar energy into mechanical energy, using so-called thermocouples, creating an effort between hot and cold contact points between two different metals, such as nickel and iron (Das D, 2004; Mahkamov, 2004; Jokar and Saleh 2015).

Utilization of China's solar energy: China added 53.06 million KW of new photo-voltaic installed units in 2017, an increase of 54% over the previous year, accounting for 40% of the total annual new installed power in the country. Among them, the growth rate of new centralized photo-voltaic installers slowed down, with 33.62 million KW new installers nationwide, an increase of 11% over the same period last year; The explosive growth of distributed photo-voltaic (DPV) has reached 19.44 million KW, an increase of 3.7 times over the previous year. In 2017, the cumulative installed capacity of photo-voltaic power generation in China was 130 million KW, an increase of 69% over the previous year, which accounted for 7.3% of the total capacity of power generation equipment in the country, and an increase of 2 percentage points over the previous year. Among them, the cumulative installed capacity of centralized photo-voltaic is 100 million kW and distributed photo-voltaic is 29.66 million KW. In 2017, photo-voltaic power generation reached 118.2 billion KW h, a significant increase of 79% compared with the previous year, (Shaonon *et al*., 2017; Tchanche, 2011; ASAE, 1975, El-Amami, 2001; ECGD, 2013, Strbac, 2011; Castronovo and Lopez, 2004).

The world's water problems could be solved by a process called desalination, that is taking ocean water or saltwater and running it through a process which strips the salt out of the water turning it into fresh water, (Connolly *et al.,* 2011). As of now the process is not very energy efficient, but I believe that can and will change soon. With 1% of the world's population depending on desalinated water for daily needs, it is only a matter of time before more energy efficient means are attained (Mansour *et al*., 2015). Ground water and clean rivers are the way to go right now, but these sources are not always available to all parts of the planet. And desalinated water is healthier than most fresh water sources by containing less salt and lime scale in it, (Mansour *et al*., 2015; Mansour 2015).

The objectives of the current research work are treating of sea water by solar energy and using the water treated by a drip irrigation system for crop water productivity.

Materials and Methods

Using solar energy in desalination techniques

Methods of desalination: **1**. Desalination by solar energy, 2. Desalination by Mixing fresh with saline water, Aurecon and SA water discuss the planning, design, construction and operation of desalination plant used shallow and Deep Wells water resources were constructed at Sunite Left Banner district and sea Water from Hexigten Banner district, Inner Mongolia, China, (Shaonon *et al*., 2017; Tchanche, 2011; ASAE, 1975, El-Amami, 2001; ECGD, 2013, Strbac, 2011; Castronovo and Lopez, 2004, Connolly, *et al*., 2011; Mansour *et al*., 2015; Mansour *et al*., 2015; Mansour 2015, Mansour 2015, Mansour and Elmelhem, 2015; Mansour *et al*., 2014; Parastegri *et al*., 2014; Eldardiry, 2015, Aballa *et al*., 2019). A sustainable solution to water shortage as shown in Figures 1; 2; 3 and 4.

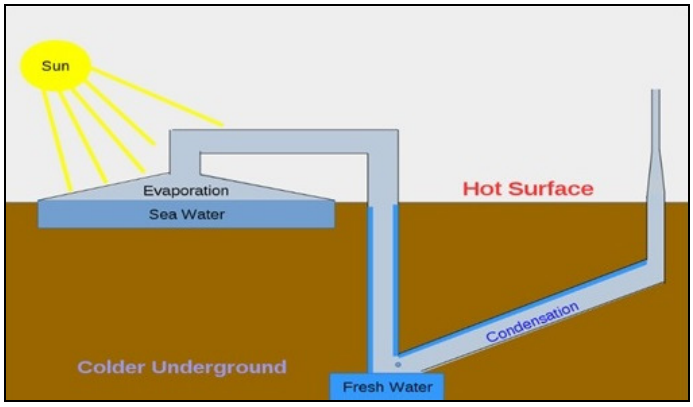

Fig. 1 : Using solar energy for seawater desalination

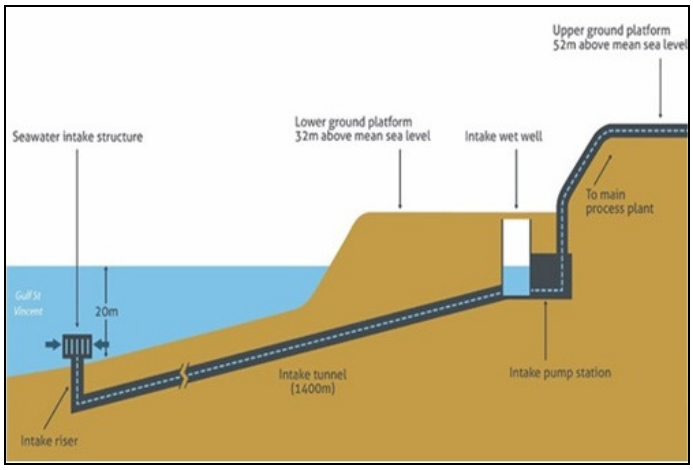

Fig. 2 : Seawater intake system

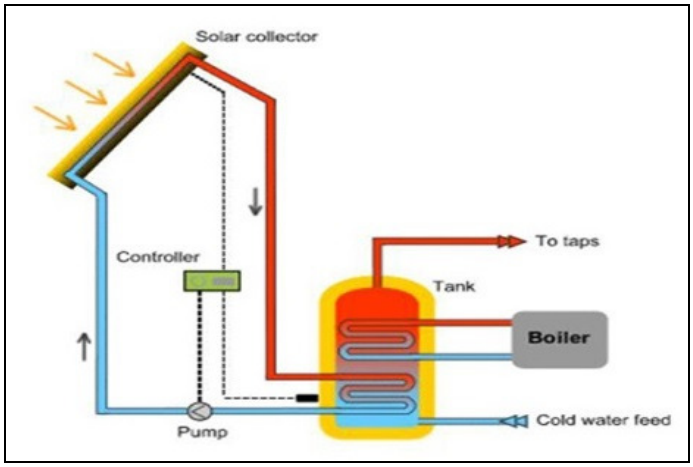

Fig. 3 : Seawater desalination

Fig. 4 : Using solar heating in desalination

Among them, the centralized photo-voltaic power station generated 102.6 billion KW h, an increase of 65% over the previous year, and the distributed photo-voltaic power generation reached 15.6 billion KW h, an increase of 1.8 times over the previous year. In 2017, the proportion of photo-voltaic power generation in total power generation increased further, from 1.1% in 2016 to 1.8%. Figures 5, 6 and 7 are the famous renewable energy power plants at Hohhot, Inner Mongolia, China, (Kapsali *et al*., 2012).

Fig. 5 : Solar power plant at Hohhot, Inner Mongolia, China.

Fig. 6 : Solar Parabolic power plant at Ordos city, Inner Mongolia, China.

Fig. 7 : Wind power plant in Hohhot, Inner Mongolia, China.

Drip irrigation system, (Manour and Elmelhem, 2015, Mansour *et al*., 2015, Mansour *et al*., 2014, Papaefthymiou and Papathanassiou, 2014; IRENA, 2015 and Wazed *et al*., 2017).

Drip irrigation networks include the following components are:

The main control unit and its location at the water source and includes a 3/3-inch centrifugal pump, powered by an electric motor (pump 80 m3 / h, 48-inch filter unit, 2-inch filter and 120 mesh filter, pressure meter, control valves and Add fertilizer through irrigation (Venturi device).

The main line: PVC pipes and internal diameter of 100 mm and transfer water from the water pump to the starting points of the main subways in all parts of the field.

Sub-Main lines: PVC pipe, inner diameter of 50 mm and transfer water from the main lines to the branches, tubes of drippers in the case of drip irrigation system or installed on the sprinklers in the case of sprinkler irrigation system.

PE type dotting pipes with internal diameter of 16 mm on which irrigation equipment (drips).

Drippers: Type GR and flow (flow rate) 4 liters per hour at operating pressure 1 bar and distances between drippers were 30 cm Figure (8)

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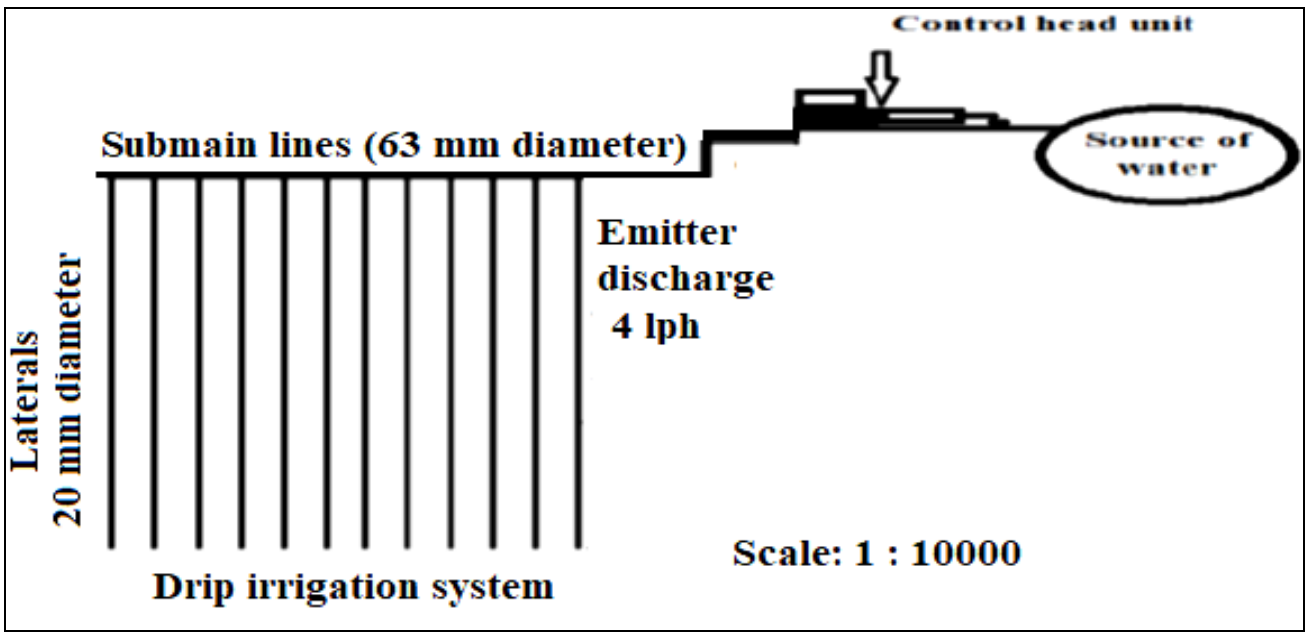

Fig. 8 : Layout of drip irrigation system

The drip irrigation, automatic control system consists of damp sensors, temperature sensors, signal circuits, digital adapters, an LCD module, a data transfer engine and a spiral coil control. Signal is sent via the unit and important data are automatically estimated by ground moisture and temperature measurements. RTD, such as PT100, is used as temperature sensors, but a density sensor can be used to detect soil moisture. The sensors are installed in the soil below a certain depth (determined by the planted plant). When moisture is reduced to a certain level, RESALE signals to the control unit for the purpose of stopping irrigation and this transmits it to the valves and valves for network irrigation and related electric drip irrigation system control unit (working by the storage power in batteries by solar and wind energy in the farm) are executing a command to shut down and so's automatic system is activated without the intervention of the human factor in the process throughout the growing season and even begin to harvest measures of Automation controller unit and Application in Field, (Martin *et al*., 2013, Global *et al*., 2013, Chandel *et al*., 2015, Johns *et al*., 2016, Lopez *et al*., 2015, Kumar *et al*., 2015 and Fabeiro *et al*., 2001).

Results and Discussion

One of the most important characteristics of drip irrigation is the expulsion and removal of salts from the root growth area, and therefore the process of washing the quantities of salts that accumulate in the root zone in the period before planting for the next crop, and in order to get rid of soil salts from the soil with saline problems permanently. It is very difficult and necessary to adapt and control with these salt conditions in the soil so that the proportion of salts in certain limits so as not to be exceeded leading to the death of the plant, and this control is achieved through the integration of various agricultural processes such as plowing, fertilization, irrigation, drainage and treatment saline soil problems need to:

1 - Add agricultural gypsum to the soil where the quantities are added according to the salinity of the soil after the analysis, add half to 1 ton per year per feddan if the salinity is greater than 4 mmoz, and add an amount of 2-4 tons per feddan per year if the salinity between 4-8 mmoz 5-8 tons per feddan per year if salinity is between 8-12 mmoz,

2 - in the preparation of the soil for the preparation of a specific soil for the process of washing the soil so that the soil should be split two perpendicular to facilitate the process of washing the soil is washing by irrigation by flooding or sprinkling irrigation at a rate of 100 m 3 per feddan once every week and the analysis of the soil after each retin this way In order to determine the effect of treatment on the salinity of the soil and in the case of solving the problem is stopped washing, the use of modern mechanical equipment in agriculture and irrigation operations for low-cost pastures were used pipes buried under the soil in the pastoral areas of the study area in Mongolia Alda Mechanism and specifically the northeast part of China.

When configuring drip irrigation system, in order to achieve a flow rate of 4 tons/hour, different power photo-voltaic components and submersible pumps are needed for different lifts. Usually a 10-meter lift requires 800W components with a 500-watt submersible pump. When the lift reaches 120 meters, it is necessary to increase the photo-voltaic module to 6 kW and cooperate with the 4.5 kW pump. Grassland root cutting and re-sowing pipe burying machine mainly consists of seed, fertilizer box, suspension frame, hydraulic cylinder, walking wheel, double disc ditcher, seed fertilizer ditcher, drip irrigation pipe burying mechanism, seed conveying mechanism, soil recovery, repression mechanism, drip irrigation pipe bracket pressurizing mechanism, drip irrigation pipe bracket and U-shaped clamp. This machine can complete soil loosening, root cutting, re-sowing, fertilization and drip irrigation pipe laying at one time. The combined operation of road and crushing greatly reduces the times of rolling grassland, realizes and satisfies the operation requirements of drip irrigation improvement technology for Natural Mowing grassland. The machine has high production efficiency, simple structure, simple operation and low cost. It is suitable for Natural Mowing grassland, natural grassland improvement, rejuvenation and regeneration, and small and medium-sized grassland artificial grassland construction as shown in Figures. 9, 10 and 11.

Fig. 9 : Solar low-cost pasture irrigation technology

Fig. 10 : Boyang's wind-solar complementary power generation and irrigation system

Fig. 11 : Chinese and Egyptian experts together

The cooperative enterprise registered guotai pastoral public service co., LTD according to the energy use situation of Sunite Left Banner pastoral area. Enterprises from research and development, demonstration, to provide public services for pastoral areas, accelerate the transformation of scientific and technological achievements. Such public services include water delivery services in pastoral areas, maintenance of wind-solar complementary systems, storage cellars, construction of deep-water Wells, and maintenance of houses. By means of market operation, the government purchases services to solve the thorny problems in pastoral areas, providing a new solution for pastoral areas to socialize services. The pastoral area public service company has an electric appliance repair workshop, farm and animal husbandry machinery repair workshop, charging room, training room, tourism demonstration site, herdsman's home, etc. as shown in Figures 12 and 13.

Promotion of high-power wind-solar complementary power generation system in Inner Mongolia

With the continuous improvement of living standards in pastoral areas, the power consumption of herdsmen in the Inner Mongolia autonomous region is growing rapidly. The original low-power generation system cannot meet the power demand of herdsmen, so the high-power wind-solar complementary power generation system is urgently needed to meet the current household electrical demand in pastoral areas. Since 2015, Hohhot Boyang renewable energy co., LTD., a cooperative enterprise with Xilingol Vocational College, has been popularizing high-power wind-solar complementary power generation system above 2kw on a large scale in the Inner Mongolia. By the end of 2017, 3,700 units had been installed in Xilingol league in the Inner Mongolia autonomous region.

Fig. 12 : Sunite Left Banner guotie pastoral area public service company

In 2018, the government of the Inner Mongolia autonomous region will vigorously promote high-power wind-solar complementary power generation systems in various cities, installing 1,600 sets in Alashan League, Bayannaor league and Wulanchabu league in the west. At present, 12,000 sets of wind-solar complementary power generation systems have been promoted in various regions. The high-power wind-solar complementary power generation system can generate 6-12 KWH of electricity per day, which can fully meet the daily needs of herdsmen, such as lighting, TV watching, computer, electric rice cooker, induction cooker and water carrying.

Fig. 13: Basic configuration of high-power wind-solar complementary power generation system

Grid-connection technology for medium-sized wind power generation

In April 2019, the 10kw wind turbine developed by the company was successfully connected to the power grid, with a diameter of 7.8m. The type of speed regulation is active yaw, automatic braking through power loss, simple structure and convenient operation. The blade efficiency is up to 0.44 with the optimized design of the wind turbine profile, and the blade is fixed and connected with a flange. The root is wide and thick, which is not prone to fracture. The motor adopts synchronous rare earth permanent magnet three-phase AC type, gearbox without increasing speed, rated speed 180rpm, high power generation efficiency, up to 0.92. The front end of the rotary body is fixed to the generator, and the bottom end is fixed with the rotary bearing and the tower. The central control system controls the slewing support by reading the data of the wind vane and anemometer, to achieve the purpose of upwind or deviating from the wind direction and realize the normal output and speed regulation. With advanced electronic control system and reliable grid-connected, it is an ideal project for poverty alleviation of wind power generation and benefiting herdsmen.

The successful research and development of this model has accumulated experience for the current university and enterprise to jointly carry out the Inner Mongolia autonomous region science and technology planning project -- "100kw distributed wind power generation system". At present, the base design and construction has been completed in Shangdu county, and the blade and rotate body design and manufacturing have been completed. Now, the optimum design and test of the generator and control system are being carried out.

Solar low-cost pasture irrigation technology in pastoral areas

It can be used together with no-tillage, root-cutting, reseeding and pressing machine to improve grassland and solve the problem of soil consolidation. By adopting the method of no-tillage, the mechanical root cutting, and the asexual propagation of herbage can be realized, and the local fine grass seed can be reseeded appropriately. Main technical points: by means of no-tillage, reseeding and pressing pipe-laying machine, the drip irrigation pipe is embedded at the bottom of the seed bed, and reseeding and covering soil are carried out in time; The solar energy intelligent control system is adopted, and the direct driving submersible pump can be divided into time division and drip irrigation. There is no need for adequate water supply, pressure can be measured in reduced pressure shunt control, and soil moisture or nutrients can be measured for water or fertilizer application. To achieve vigorous growth of herbage. Its main features are:

The use of renewable energy (solar and wind energy) is used. Solar energy is used to treat salty sea water and to produce water with different saline levels. Wind energy is used in the process of pumping water from the sea to be treated. It is also used to pump water and raise it in large reservoirs for agricultural use. Storage of renewable energy from both sources (solar and wind energy) in batteries for domestic, electrical, lighting and other purposes. The drip irrigation system was used by automatic control using electric energy from these batteries.

A field experiment was conducted on drip irrigation the different systems are the surface drip irrigate under a shallow depth of 15 cm, drip irrigate under the shallow depth of 25 cm was the use of two degrees of saline water 40%, 70% of fresh water compared to the degree 100% wheat crop

It was found that the use of drip irrigation and water treated with different salinity degrees in the presence of renewable energy use (solar and wind energy) was the result of the productivity of the water under the system of drip irrigation at a depth of 25 cm followed by a system of drip irrigation at a depth of 15 cm and less using the surface drip irrigation system and also water salinity degrees was the best under 70% or 100% of fresh water for non-significant difference between them and less under the degree of salinity 40% of fresh water. The summary of the results showed that the use of the subsurface drip irrigation system with a depth of 25 cm with both saline water 70% or 100% of fresh water was better than other cases and then use a drip irrigation system with a depth of 15 cm with the same salinity levels.

Discussion

In the present study, sea water was relied on as a source of water and the efficiency of the irrigation system that was used played a big role in the irrigation process, where initially large quantities of sea water were used during the treatment process and then was used to mix water from another source is deep wells High salinity cannot be used directly in irrigation and will also adversely affect the efficiency of the modern irrigation system. After the treatment and reduction of salinity, the irrigation system was used. This study was consistent with Fabeiro *et al*., 2001; Gee and Bauder 1986; Mansour, 2016a-e, Mansour *et al.,* 2015 a-e, Tayel *et al*., 2018. According to (Ibrarim *et al*, 2018; Tayel *et al*., 2018; and 2016; Goyal and Mansour, 2015; Tayel *et al.,* 2012a,b) salt may accumulate on the surface of agricultural land before descending to the level of soil depth at the root zone, when using the system of surface drip irrigation DI and in the case of the use of subsurface drip irrigation SDI has developed a lot where the salt is not accumulated On the surface not even at the root zone where it helps to expel it completely from the level of the root zone and thus helps to improve the plants and crop productivity and quality.

The process of freezing sea water is divided into two methods: direct freezing method and indirect freezing method in order to reduce costs and accelerate the treatment of large amount possible water in record time in light of the ever-increasing need to exploit unconventional water sources to try to bridge a very large gap between Water supply and supply, with a view to also the need for sustainable development and the needs of increasing population growth, (Mansour *et al*., 2005, Mansour 2006, Mansour *et al.,* 2010a; Mansour *et al.,* 2010b; Mansour, 2012; Mansour and Aljughaiman 2012; Mansour and Gyuricza 2014; Mansour *et al.*, 2013; Mansour and Elmelhem 2013).

The projects of the water treatment industry in the Arab region, especially in Egypt, have been conducted by several studies by (Mansour and Aljughaiman 2012, Mansour and Gyuricza 2014, Mansour *et al.*, 2013; Mansour and Elmelhem 2013) where it is expected that the average access to the Arab citizen only about 700 cubic meters of water, which is equivalent to a percentage of 88% of the limit Water poverty estimated at 1000 cubic meters per capita per year, and the projects of water treatment industry in the Arab region of the most important basic industries in this region, therefore we find a very large spread of a huge number of large and large treatment plants in the Arab region and because of the expensive and very large equipment and use of foreign expertise There are many in them Its costs are very high, and this motivates scientific research in this field to develop the industry by trying to reduce costs in recent studies and future plans, (Abd-Elmabod *et al*., 2010, 2017 and 2019a,b; Abbas *et al.,* 2019).

FAO has estimated land resources estimated at 200 million hectares as newly reclaimed and new agricultural land to produce different crops and fruits. Only 93 million hectares can be used for this agricultural expansion and, unfortunately, most of these areas are empty. Forests that must be preserved for the purpose of ecological balance and global climate agreements on the entire planet, (Rojas *et al.,* 2012, 2015 and 2017; Romero *et al*., 2015, Mansour *et al*., 2019a,b,c).

The degradation of the fertile conscious land is one of the bad problems for which we must mourn and always endeavor tirelessly to find urgent solutions to it. This degradation occurs as a result of salinization, destruction or pollution in most of the countries of the countries located in dry and semi-arid regions (Abd-Elmabod *et al*., 2010, 2017 and 2019a,b; Abbas *et al.,* 2019; Rojas *et al.,* 2012, 2015 and 2017; Romero *et al*., 2015, Mansour *et al*., 2019a, b, c). The incentive for humans to seek alternative and different sources of land and water in these areas is greater and greater in order to increase agricultural production of crops and increase the quality and increase vegetation, where there must be continuity of both horizontal and vertical expansion using non-conventional and conservative water resources [105-

108]. In addition, (Abbas *et al.,* 2019; Rojas *et al.,* 2012, 2015 and 2017; Romero *et al*., 2015; Mansour *et al*., 2019a,b,c).], they illustrated the great importance of agricultural practices and irrigation management in order to increase crop production and quality.

Conclusion

In the current study, renewable energy was used in its sources (sun and wind), where the sun's energy was used to treat sea water and produce treated water at different salinity levels. Wind energy was used in the process of pumping water from the sea for treatment to reduce costs. The process of pumping water and lifting it to huge tanks for use in agriculture, when storing the energy generated by renewable energy sources (sun and wind) in large batteries for the purposes of domestic and electrical and street lighting, etc. The use of electrical energy from these batteries and solar energy was used significantly in the operation of the valves of the drip irrigation system in these experiments in the region of the automatic system.

It can be recommended to use renewable energy in its sources (sun and wind), in all purposes in order to develop remote and remote areas that need equipment and costs are very large to develop now. For the production and quality of grain crops and a significant saving in traditional energy sources.

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