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Renewable energy to develop adaptation strategies to the climate change conditions

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Changes in land use and combustion of fossil fuels have been largest human impact on the global carbon cycle and without a complete accounting of net greenhouse-gas (GHG) fluxes, developing and evaluating adaptation strategies are not possible. The major source of GHG fluxes associated with crop production are soil N2O emissions, soil CO_2 and methane (CH4) fluxes, and CO_2 emission associated with agricultural inputs and farm equipment operation.
This study points out the main principles which are at the base of solar energy use for sustainability of irrigated agriculture. Field tests were carried out in order to compare crop yield and solar pump plant performance, for the photovoltaic conversion of solar energy, connected to drip irrigation and sprinkler system plants during the irrigation season.
The system mainly consists of the parts listed here: set of flat photovoltaic panels consisting of 150 panels for a total of 3000 W peak value once installed, connected in serial-parallel to obtain a 120 Vdc operating voltage rating. The panels utilize 36 serially connected single-crystal silicon cells providing a 12 V voltage rating. The serial connection of 10 panels generates the system's operating voltage rating (120 Vdc). The total 3000 W peak value power is obtained by connecting in parallel 15 serial-strings. When the circuit is open, the voltage at the ends of the panels can reach 210 Volts. The photovoltaic system supplies, through an inverter, a three-phase 1.6 kW canned pump located in the artesian well. The relevant hydraulic line connects this pump to the various utilities.
The hydraulic capacity of the helium pump has been used during the irrigation season in order to meet the water needs of a corn crop. Therefore, along with the solar pump was used a dispersing wing type drip irrigation system with double chamber hosing (70 kPa operating pressure), with external holes spaced 0.3 m apart, 0.75 m distance between the wings, wing length 120 m and placed between the corn rows.
During the irrigation tests for the autoclave pressure values already mentioned, we obtained an 80 l min-1 flow rate value with a 28 m head value measured by pressure gauge upstream from the electric pump. In these conditions and on sunny days a 26 m3 water body was obtained. From the agronomic point of view, the crop developed more than usual, did not undergo parasite attack nor lodging or cutting off of the steams during the biological cycle, and the development of weeds was limited. The grain production amounted to 10.5 t ha-1, 12.4 % higher with respect to the rain-irrigated parcels. Crop yield results showed better performance of the drip irrigation plant with respect to the sprinkler system.
The photovoltaic system met design expectations and showed good reliability during the years of testing. The long-term tests showed that the photovoltaic system is capable of supplying a farm.
The problem linked with combustion of fossil fuel will improve this system of energy supply to agricultural farms located in areas not reached by the power network both in Europe and in the sub Saharan countries where many plans are developing in last year pursuing also the scope of a drastic reduction of GHG fluxes.

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