# Possibilities for exploitation of renewable energy sources in irrigation or other agricultural utilization

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This work was carried out in two parts, first, was to study the possibility of using wind-pumps in irrigation of the small holding areas. To achieve that, wind speed data at the windy locations in Egypt was collected and the most suitable areas for wind utilization were defined. The locally made (MF 99) wind-pump was evaluated under different climatic conditions at Matruh region. The maximum area served by wind-pump was also determined at different pumping heads. The most important results could be summarized as follows:- At Matruh location where the experiment was carried out, the average wind speed ranged from 4.42 m/s in October to 6.98 m/s in February.- The discharge, water and wind power, rotational speed, number of strokes increased with increasing the wind speed. However, the efficiency decreased with increasing windspeed.- The wind pump (MF 99) was evaluated and the average daily supply was determined. It was found that this type of wind-pump could supply water of 25854m3 of water/season at 4m lifting head, which is sufficient to irrigate an area of 2.5 feddans of field crop, vegetable or fruit trees by surface furrow irrigation method. At 10m lifting head, the pump can supply of 10341 m3 of water/season which is enough for 2 fed of fruit trees field irrigated by drip irrigation method. Also operating the wind pump to lift water and pumping itwith total dynamic head = 20m gave 517 m3 of water supply/season which can irrigate only one fed an fruit trees by drip irrigation system.- The average hourly cost of water pumping by t e MF99 wind pump type increases with increasing of the water lifting, where, the average hourly cost of the pump wa. 0.07 L.E/ m3 at 4 m compared to 0.17 L.E/m3 and 0.34 L. / m3 of water pumping at 10 and 20 m heads, respectively.Second part, was to study the feasibility of utilization of solar energy in drying rice paddy after harvesti g. To achieve that, three experiments were carried out. First w s to study the temperature distribution inside the greenhouse s a solar dryer with and without materials. Second, was to stu y the effect of recircualtion of the hot air and its direction inside tic greenhouse on the temperature and relative humidity inside the greenhouse and drying rate. Finally, rice paddy was dryi g using three different systems, greenhouse dryer with air internal recirculation, solar dryer with collector, and dryin: in the direct-sun. Temperature, relative humidity, paddy in i isture content change and the drying rate were determined. The most important results could be summarized as follows:The average temperature recorded at differen locations the empty greenhouse was (29-41°C) which was higher (by 6-16 C) than the ambient temperature (23-25 2) during the daytime.The average temperature recorded at different locations inside the greenhouse with sawdust at 25% moisture content was (27-38 °C) which was higher (by 4-12 °C) than the ambient temperature (23-26 °C) during the daytime.Air recirculation from the top to the bottom was found to be better than air recirculation from the bottom to top of the greenhouse through the sawdust (at 25% MC).The rice temperature increased from 21-31°C during the daytime under the greanhouse drying system, and from 21-30°C under the shelves solar drying and 22-29C under the direct sun drying system. Using the greenhouse dryer, rice temperature ranged from 21-30°C with agitation, whereas, it ranged from 24-31°C without agitation.Using the shelves solar dryer, rice temperature ranged from 23-30C with agitation, whereas, it ranged from 21-29C without agitation.Rice temperature ranged from 22-27°C with agitation, whereas, it ranged from 23-29°C without agitation under the direct sun drying system.The average relative humidity decreased from 52-70% during the daytime under the greanhouse drying system, and from 60-73% under the

shelves solar drying and 63-78% under the direct sun drying system.Drying rice in the greenhouse was faster than both shelves and the direct-sun drying system, where, rice moisture content decreased to 17.7%, 19.5 and 20.1% under the greenhouse, shelves solar dryer and the dire systems, respectively.Drying rice with agitation was faster than th, agitation under all drying systems where, r content values were 17.0%, 18.5 and 19.1% and 18.4%, 20.5 and 21.1% without agitatio greenhouse, shelves solar dryer and the dire•systems, respectively.t-sun dryingt of with no ce moisture ith agitation under the t-sun dryingDrying rate in the greenhouse ranged from 0.6-4.4/0 compared to 0.6-3.7% and 0.9-2.9% for the shelves solar lryer and the direct-sun drying systems with agitation, respective y.Drying rate in the greenhouse ranged from 0.8-3.6 to 0.6-2.3 % and 0.9-1.5% for the shelves solar direct-sun drying systems without agitation, respectThe greenhouse effectiveness of the grcenhous air decreased gradually from 40.05% at 10: 00 al at 16: 00 pm.The greenhouse effectiveness in drying proce gradually from 23.7% dring the first day of dryi after the fourth day of drying./0 compared rycr and the vely.•in heating to 29.73% s decreased g to 4.15%The drying coefficient of rice drying (a) values with agitation were lower than those of without agitation under dif Brent drying systems. These values ranged from 0.08- 0.13 h-I with agitation, while it ranged from 0.125- 0.183h-1 without agitat on.It was found that the greenhouse drying syste n was least expensive (0.05 LE/kg) compared to the shelve and direct-sun drying systems (0.1 and 0.08 LE/kg).