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Use of Waste Water from Overflowing Village Ponds in Irrigation by using Solar Powered Micro Irrigation Infrastructure

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Abstract: With a view of augmenting water for irrigation purpose & assured supply to the every field, a new intervention has been proposed for utilising surplus water from overflowing ponds in the villages. Working on these lines, Installation of Solar Powered Micro Irrigation Infrastructure has been proposed by selecting the nearby area of the overflowing village ponds by providing common infrastructure with components Sedimentation tank near pond, Pumping Unit (Solar Powered), Filtration units, HDPE pipe network/Hydrant/Outlet assembly, Valves etc with Drip/Sprinkler irrigation sets. The sedimentation chamber will be constructed to settle out the coarse particle thereby providing clear water to the fields. A solar pump of the required capacity will be installed, which will be connected to a filtration unit and after filtration mains and sub mains will be laid by using HDPE pipes. One hydrant will be provided average on 4 acres. It is also proposed to provide one set of sprinklers to the Water User Association for their use to initiate them into use of Micro Irrigation. In this manner, this pilot project will be able to bring new area under irrigation and also gainfully utilise surplus water, otherwise going waste.

Keywords: Solar, Micro Irrigation, Overflowing Village Ponds, Irrigation Efficiency.

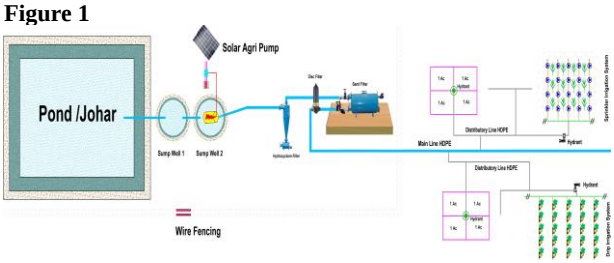
1. INTRODUCTION

There are small water bodies either man made or natural, which have been in use since ages. They are traditional water harvesting structures and the water stored in these structures is commonly used for washing/bathing for animals and raising fish. These small water bodies can play an important role in improving the ecological system and help to maintain biological diversity. In the state, the ponds are used for variety of applications. The role of water harvesting systems in semi arid and arid zone is to provide life saving irrigation to low duty crops in the monsoon season and if possible one or two irrigation to raise crop in the dry season. In canal command area a rapid decline of available irrigation water has been observed in many parts of the state due to scarcity of rainfall and increasing demand for water from non agricultural sector. Thus, water for irrigation is becoming both scare and expensive. The problem is more aggravated when ground water is saline and not fit for irrigation use. One characteristic feature of every village is the presence of village pond. Whereas presence of one pond in each village is normal feature, bigger villages also have more than one pond. All the waste water from the village households flows into these ponds. Over the years these ponds have played a major role in day to day activities of village community. With the increase in piped drinking water supply system to the households in villages, the water flowing into these ponds have increased considerably over the years. Often village ponds are seen overflowing, as there is continuous flow of water into these ponds. The stagnant water in these ponds have also lead to various health hazards in the villages besides numerous other environmental, economic and social impacts. Very few ponds have drainage systems wherein the water from village ponds could be drained, so that pond could be cleaned. It is commonly said that cleanliness of a village can be gauged from the status of village pond. The water in ponds is generally household or livestock waste water, which is not at all hazardous for use in irrigating crops. Although there are scattered instances wherein the farmers of villages are utilizing water from ponds for irrigation but these are mostly on temporary basis. This activity coupled with irrigation pipeline shall be immensely beneficial for village community. The utilization of pond water for irrigation will itself help in rejuvenation of ponds as there shall be no stagnant waters in the ponds

2. METHODOLOGY

Solar Powered Micro Irrigation Infrastructure in the Overflowing village pond Commands has been installed by providing Sedimentation tank near Pond, Pumping Unit (Solar Powered), Filtration units, HDPE pipe network/Hydrant /Outlet assembly, Valves etc. in the command area of Village Pond, as shown in layout plan Figure-1. Drip/Sprinkler irrigation sets will be installed by the individual farmers in their farm holdings by availing the benefits of subsidy. It is proposed to construct sedimentation tank of appropriate size near pond. Solar powered pumping system has been installed nearby the sedimentation tank with proper filtration systems to avoid any chocking. Water has been carried to entire area selected nearby the Pond through HDPE pipe line network under pressure. The entire pipe network has been buried under ground at 3 feet deep to avoid land acquisition. Water with the requisite pressure for running of the drip/sprinkler set has been made available to each shareholder at his farm holding through the common infrastructure to be operated & maintained by the Water User's Associations.

Figure 1



3. DESIGN PARAMETERS

Modified penman method has been used to find out crop water requirement and computed the peak water requirement in rabi & kharif season. In this scheme average water requirement of 2mm/day has been considered. Considering this crop water requirement and capacity of pond along with per capita discharge per day, each component of this scheme shall be designed in such a manner that minimum operating pressure of 2.5Kg/cm^2 available to the farmers on their farm gate. Size of the sedimentation tank has been designed by considering per day inflow in pond and volume of water accumulated as effective outflow in million litres per day. Solar pumping system is a vital part of this scheme and in this scheme solar powered pump has been considered. At least one pump is provided in a block of area 40 to 50 Hactare. Solar pumps of the capacity up to 10 to 20HP is preferred with average working of 6 hours/day. The HP of pump set required is based upon design discharge and total operating head. The total operating head is sum of total static head, friction loses worked out with hazen-williams equation in pipeline network and losses in filtration unit. Pipes in main line and sub-main shall not be below 110 mm (OD) and the size shall be decided based on the criteria to limit the friction loss in the main & sub main keeping the minimum flow velocity in the pipeline as 0.6m/sec.

$$\text{HP of pump set} = \frac{QxH}{75e}.$$

Q = discharge (in LPS)
H = head (in meter)
e = Pumping efficiency

Solar PV array of at least 1100wp capacities has been installed per HP rating of pumping sets and total capacity of the Solar pv array for operation of solar pumping sets has been worked out in such a manner that solar energy generation from the PV power system in no case be lesser than the total energy requirement to run the Micro Irrigation System.

4. CONCLUSION

Significant irrigation from tube wells are being done in various parts of Haryana where water use efficiency is very poor and ground water wastage in shape of flood irrigation is being over exploited. It causes wastage of electricity. Use of micro irrigation infrastructure on overflowing village ponds will reduce the use of tube wells by which ground water will be saved and extra water will be used which was otherwise going waste. More area can be brought under irrigation by using pond waste water, which was otherwise either rain fed or irrigated by tube wells. Where there is no possibility of irrigation through canal commands and ground water is very low, the only solution is creating of Micro Irrigation infrastructure on overflowing village ponds. Where the ground water table is very high with brackish water, there are chances of creating the situation of water logging, which is harmful for soil properties, in these areas, it is essentially required to minimize the flood irrigation by replacing with micro irrigation. Hence, by installation of Solar Powered Micro Irrigation Infrastructure on the over flowing Village pond through integrated approach of supply management and demand management, yield & net sown area will increase. Dependency of tube well & overexploitation of ground water will decrease, and above all it will help to change of the mindset of the farmers towards the use of available water judiciously.

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