COMMUNITY BASED SOLAR / GRID POWERED MICRO IRRIGATION INFRASTRUCTURE PILOT PROJECT, HARYANA: A CASE STUDY OF INCREASE IN FIELD APPLICATION EFFICIENCY IN SINGHWA DISTY., VAII LAGE –MASUDPUR, HISAR, HARYANA (INDIA)

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Abstract
A unique Pilot Project first of its kind in India for “Installation of Community Based Solar/Grid Powered Micro Irrigation Infrastructure in existing canal commands in various districts of Haryana” successfully commissioned & maintained by Jain Irrigation Systems Ltd. Jalgaon, Maharashtra, India on turnkey basis for a total CCA of 2231 hectare in 14 outlet commands of 13 district of Haryana in the jurisdiction of Command Area Development Authority (CADA Haryana).

The paper mainly discusses, post project field experience in increasing field application efficiency by using resource to root approach in water management by increasing the available canal water supply with reduction in conveyance losses and by increasing the field application efficiency with the use of Micro Irrigation Infrastructure network in one of the outlet RD 25300/L, Singhwa distributary, village Masudpur, Hisar district of Haryana. This purpose was served by providing common infrastructure with components Community based water storage pond near canal outlet head, Pumping unit, Solar cum Grid Interacted Hybrid Inverter with bi directional metering arrangement, separate 11 KV HT line, Filtration unit, HDPE rising main, HDPE distribution network, Hydrant assembly with butterfly valve at the farm gate of individual beneficiary at every 4 Acre area or lesser land holding for equitable distribution of 2.5 Kg/cm² pressurized water at remote hydrant for smooth operation of Drip, Micro, Mini or Overhead Sprinkler Irrigation systems keeping in view crops & crop rotation.

INTRODUCTION

In the state of Haryana annual designed intensity of irrigation has been fixed as 62% on the Bhakra Canals and 50% on the Western Yamuna Canal. After assessment of the water availability over the year and during each crop season, the extent of the area to be brought under canal irrigation is determined, this leads to the fixation of the annual intensity of irrigation. The annual intensity of irrigation is split further, crop-wise i.e. Kharif (from 1st April to 30th September) and Rabi (1st October to 31st March).

A total Cultivable Command area at canal outlet RD 25300/L, Singhwa distributary are 158.64 Ha and major crops in Kharif (Bajra, Cotton, Guar, Moong &Groundnut) and in Rabi season (Wheat, Oil seed, Gram & mustard). Ground water quality is saline and not feasible for irrigation, therefore crops or only dependent on canal irrigation being undulating area and sandy soil, field application efficiency with kachha watercourse was merely 50% in both Rabi & Kharif season. After implementation of
Pilot project field data shows that with revised irrigation scheduling / warabandi&pressurized irrigation up to farm gate with equitable distribution field application efficiency has increased from 50% to 150% annually. Besides water saving other benefits have also been noticed such as increase in crop yield, improvement in crop quality, conservation of energy, reduction in labour cost, increase in feasibility of irrigating difficult terrains etc.

**METHODOLOGY**

Solar /Grid Powered Micro Irrigation Infrastructure in the Canal Command of outlet RD 25300/L, Singhwa distributary, village Masudpur, Hisar district of Haryana has been installed for an area of 158.64 Hectare by providing Community based water storage Pond near outlet head, Pumping unit (Grid /Solar Powered), Filtration units, HDPE gravity feederline, HDPE rising main, HDPE distribution network, Hydrant assembly with butterfly valve at the farm gate of individual beneficiary at every 4 Acre area or lesser land holding for equitable distribution with minimum 2.5 Kg/cm² pressure rating at remote hydrant smooth operation of Micro Irrigation system keeping in view crop & crop rotation. Modified penman method has been used to find out crop water requirement and computed the peak water requirement in rabi&kharif season. Design of this scheme is based on actual cultivable command area (CCA), approved discharge normally 2.4 cusecs/ 000 acres and schedule of running of canal outlet by collecting the authenticated data from the Canal Authorities. Each component of this scheme designed in such a manner that minimum operating pressure of 2.5 Kg/cm² available to the farmers on their farm gate. Size of the storage tank has been designed by considering discharge of the outlet and volume of water accumulated in 24 hours. A feeder pipe of required size in appropriate length has been provided from canal outlet to the storage tank by gravitational flow. Solar pumping system is a vital part of this scheme and in this scheme grid connected solar powered pump of required size has been considered to reduce the cost of electricity. Total project area has been divided in 3 equal blocks (A, B & C) with area of each block 52.88 Hectare. Total three Submersible pumps of 12.5 HP capacity were commissioned with average working of 14 hours/ day. The capacity 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 units and fittings etc.
PROJECT TECHNICAL DETAIL

Solar PV arrays of at least 1100 wp capacities has been installed per HP rating of pumping sets and total capacity of the Solar PV arrays for operation of solar pumping sets have been worked out in such a manner that total annual solar energy generated from the PV power system in no case be lesser than the total energy required to run the Micro Irrigation System and there is no net import of energy from the utility grid on annual basis. For working out the total annual energy requirement of the Micro Irrigation System likely days of running of canal outlet in a year has been considered based on the actual schedule of canal running, but total running days of the canal in year shall not be any case be less than 180.

The output power of SPV would be fed to the inverters for conversion DC to AC for operation of the motor pump sets and feeding the same into the nearest electricity grid through 11 KV, 24 hours energised HT independent line after synchronisation, when excess in requirement.

CONCLUSION

Considerable irrigation from tube wells is not possible in this area due to high ground water table with salinity, which causing the situation of water logging and affecting the soil properties adversely. Moreover, canal water use efficiency was very poor due to unlined water courses and sandy soil. Hence, it is essentially required to replace flood irrigation by Micro Irrigation technology.
Post project conjunctive use of ground water with canal water has improved soil quality as well as reduces the electric power consumption. Additional area has been brought under canal command which was otherwise rain fed. Result shows significant increase in net sown area and yield. Above all this project changes the mindset of the farmers towards the use of available water judiciously.

<table>
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<tr>
<th>Crops</th>
<th>RABI</th>
<th>Additional Area under Cultivation (Ha)</th>
<th>KHARIF</th>
<th>Additional Area under Cultivation (Ha)</th>
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<tr>
<td></td>
<td>Pre Project, area under cultivation (Ha)</td>
<td>Post Project, area under cultivation (Ha)</td>
<td>Crops</td>
<td>Pre Project, area under cultivation (Ha)</td>
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<tr>
<td>Wheat</td>
<td>16</td>
<td>55</td>
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<td>Bajra</td>
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<td><strong>36</strong></td>
<td><strong>115</strong></td>
<td><strong>79</strong></td>
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<td>On Farm application Efficiency %</td>
<td>22.69</td>
<td>72.49</td>
<td>31.52</td>
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</table>

Pre Project On Farm water application Efficiency, % 54.21
Post Project On Farm water application Efficiency, % 150.03

Sources: Field Data

Post project conjunctive use of ground water with canal water has improved soil quality as well as reduces the electric power consumption. Additional area has been brought under canal command which was otherwise rain fed. Result shows significant increase in net sown area and yield. Above all this project changes the mindset of the farmers towards the use of available water judiciously.

References

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