Pioneering Drip irrigation with zero electric energy

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ABSTRACT:

Large numbers of water reservoirs are constructed in India. Many of them supplies, irrigation water, to the command situated at substantially lower altitude. Open channel gravity flow water distribution networks are widely adopted to convey water from these sources to farm head, for irrigation. To reduce the high velocity and avoid scoring of the bed of open channel of this network, it is necessary to dissipate the high potential energy of the source water, by providing various energy drop structures. Thus naturally available energy is wasted, in other words it is a national loss. The other draw back of this system is that, there are huge conveyance losses. The water made available at farm head is then applied to the crops by flow irrigation methods. The flow irrigation also has significant application water losses. Drip irrigation can saves such losses. It is widely practiced and established method of irrigation, is gaining popularity in India. It is most suited for horticulture crops, vegetables etc. and finds applicability in areas where groundwater is scarce and helps in optimisation of the limited water resources. The system has its advantages and limitations. Its advantages are in terms of savings of water (50-60%) of that required for flow irrigation, effective use of fertilizers, less labours cost etc. The limitation for adopting of this method is its high initial cost and it requires electric energy to develop high pressure to operate the drip system. Electric energy is also scare and not available as and when required. To overcome above said problems, one group of Farmers in the command of Naghtana Irrigation Project, situated in Amaravati District of Maharashtra state, India, unite to gather, formed a Water User Association **WUA**. The WUA installed a PVC pipe water conveyance network and innovative Drip irrigation system over 145 ha of their command area. As usual, drip irrigation system of this WUA does not required electric energy to pump water under pressure in to the system. They have taken advantage of water available with high potential energy. The water under pressure is conveyed to the farm with the help of gravity flow PVC pipe network without losing energy and they got success to run their drip irrigation network satisfactorily. Thus it is a gravity flow drip irrigation System with zero electric energy. The Maharashtra Government has announced a water prize in the year 2012, to this WUA, for their valuable contribution in the water saving, electricity saving and improving water productivity. This is a pioneering example in water sector. Such techniques with necessary modifications can be adopted in the areas, where water resources are available at sufficiently higher elevation as compare to their command area. In this paper light is thrown over their innovative idea, participatory approach, techno economic feasibility and improving water use efficiency as well as water productivity.

INTRODUCTION

Nagthana Minor Irrigation Project is situated in Amravati District of Maharashtra State, India. The storage dam is constructed at higher altitude and the command area is situated at considerably lower altitude. It was plan to let out the water from the reservoir in to the river, and then restored in the three weirs namely Tivasa Ghod, Varud-1 and Varud-2, constructed across the river on the downstream side of the reservoir. The stored water on the upstream of river is to lift for irrigation, with the help of electric pumps, in the command area.

Limitation

There is acute storage of water as well as electric energy in this area. For lifting the water from the storages on upstream of the weir requires considerable amount of energy. The water which was stored in Nagthana Reservoir was at high altitude. There was no wisdom in destroying the available water potential energy at higher altitude by letting water in to the river and restoring it in to series of small weirs at lower altitude than the command area. The farmers are bound to apply electric power to lift the water for irrigating their lands. On the background energy crisis, this was a inefficient water distribution tactic. The beneficiaries strongly oppose this tactic. Farmers were irrigating 140 ha area with spending 16000 kilo watt hour KWH energy, (six month pumping in dry month of a year) Rs. 16,00,000 was the expenses on energy bill.

Values

The command area is lies 40 to 100 meter below the water stored in the Nagthana Irrigation Project. Such large water potential head is sufficient to operate drip irrigation system. The soil, climate is very much suitable for horticulture crop like orange and sweet orange. All farmers are ready to adopt drip irrigation and eager to grow orange and sweet orange.

INOVATIVE PROPOSAL

The farmers in the command, united together formed a water users association **WUA** and registered as Dr. Sharad Drip Irrigation WUA. Water Resources Department, Government of Maharashtra accepted to supply water directly from the Nagathana Reservoir for drip irrigation. For that purpose, A innovative PVC pipe water distribution network is designed and installed. The important features of the schemes are –

- A concrete intake well 6 m. diameter and 8.5 m depth is constructed on the D/s of the earthen dam.
- Water from the main head regulator is brought to this intake well by constructing an open approach channel.
- Water from the intake well is brought to water filtration chamber.
- The command area of WUA is 140 ha.
- Two gravity main PVC lines of 4 kg/cm2 pressure rating carries water for irrigation from the intake well to the command area of 145 ha.
- Water meters are installed over the pipe lines to measure the discharge through the pipe lines.
- From the gravity mains, various branches takes out to carry the water in different part of the command area, the diameter of PVC branch lines is 63 mm and the total length is 76,230 meters.
- The total cost of the scheme works out to Rs. 1146250/-
- Details of the PVC lines

Gravity Main	Discharge in LPS	Length in meter	Diameter in mm	Pressure rating of PVC pipes
Pipe line A	23	3120	180	4 kg/cm2
Pipe line B	28	6000 2730	200 110	

Comparison before and after project –

Sr. No.	Item	Before implementation of the Scheme	After implementation of the Scheme
1)	No of beneficiaries	182	
2)	Irrigated area	145 ha.	212 ha.
3)	Area irrigated with conjunctive use of surface and well water	145 ha	450 ha
	Area irrigated in ha per Million cubic meter of water	Not available	423 ha
	Electric power	16000 kwh	0
	Income Rs.	145,00,000	381,60,000

Crop wise area irrigated

Year	2007-08		2009-10		2010-11	
	Area	Yield MT per ha	Area	Yield MT per ha	Area	Yield MT per ha
Orange	40	2.10	170	2.20	270	2.40
Gram	05	0.16				
Cotton	05	0.11				
Turmeric	0		05	0.14	05	0.15
Chilly	0		25	2.40	20	2.40

BENEFITS

Every farmer in the command is eligible to get water delivery at high pressure, so that, he needs not to put an additional electric energy to run the drip system. The water distribution is done, turn by turn. The farmers are happy and enjoying the zero energy base drip irrigation system, saves substantial amount of water as well as electric energy.

CONCLUSION

In large number of storage reservoirs, the water available at high potential head is brought at lower level without using its energy, this is an indirect loss to nation. The WUA is a pioneer in saving the water and energy and increased the water productivity.

Reference

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