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A Case Study

Micro irrigation impact of new methods of irrigation in drought prone areas of Kurnool district

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ABSTRACT : Recognizing the fast decline of irrigation water potential and increasing demand for water different sectors, a number of demand management strategies and programmes have been introduced to save water and to increase the existing water use efficiency in Indian agriculture. One such method introduced relatively recently in Indian agriculture is micro-irrigation which has been proved to be an efficient method in saving water and optimum use of water efficiency and may show the benefits of micro-irrigation in terms of water saving and productivity gains. Micro-irrigation is also found to be reducing energy requirement, weed problems, soil erosion and cost of cultivation. Investment in micro-irrigation also appears to be economically viable, even without availing state subsidies. Further, the policy and technical increase awareness among the farmers about these economical and revenue-related benefits for micro-irrigation with the adoption of these two different water saving technologies namely, drip method of irrigation (DIM) and sprinkler irrigation method (SIM). Both drip and sprinkler method of irrigation are treated as distinct characteristics differences between the two terms of flow rate, pressure requirement, wetted area and mobility (Kulkarni, 2005), while "drip method supplies water directly to the root zone of the crop through a network of pipes with the help of emitters, sprinkler irrigation method (SIM) sprinkles water similar to rainfall into the field surface". Thus, this paper examines the modes of the latest micro-irrigation technologies being implemented in drought prone areas overall India.

KEY WORDS : DIM, SIM, FIM, Water saving, Cost of crops

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These are primarily to save water and increase the water use efficiency in agriculture. Thus micro-irrigation is economically viable and environmental feasible to study the professional and to prospects of drip and spanker irrigation in the study area, Kurnool district. The Empirical study on drip irrigation is aimed to improve agriculture to an extent of 3095 ha under minor-irrigation in Kurnool district in 2011-2012. Currently 2008 farmers are benefited to arrange drip system to 1548 ha, the investment on this system raised to Rs 2.64 crores brought 1989 ha land more over under cultivation benefiting 1355 farmers with an investment of Rs. 1.97crores. More over the SC, ST farmers brought under the 'Indira Jalaprabha programme' by providing equipment of micro-irrigation system. The government has provided subsidies on the basis of size of land and expenditure not to exceed one lakh. Table 1 shows the payment of subsidies to the small, marginal and big farmers based on land ceiling under caste wise consideration.

Table 1 show that 100 per cent subsides were provided to SC/ST small and marginal farmers who were having 1-5 ha of land , medium size farmers with 5-10 ha of land, have been given 75 per cent of subsides, large size farmers who were having 10-12 ha of land were given 60 per cent of subsides and the farmers who had above 12 ha of land been given 40 per cent of subsidies and the others in case of small and marginal farmers 90 per cent subsides, and to large size farmers were given 40 per cent who had more than 12 ha of land.

The agriculture development has prepared another fresh proposal allocating Rs. 1.96 crore to the exiting cultivation up to 1000 ha under drip irrigation method in which the small and marginal farmers would get 50 per cent and others my get 40 per cent of subsides as such a micro-irrigation is proved to be efficiency method compared to the commercial surface method of irrigation where water is efficiency is only about 35-40 per cent both drip and sprinkler irrigation methods are considered

Table 1 : Particulars of subsidies paid in percentages

Category wise farmers	Land limitation(in acres)	Caste wise subsidy released (%)	Others (%)
Small formers/Marginal farmers	1-5	100	90
Medium size farmers	5-10	75	75
Large size farmers	10-12	60	60
Land lord	12 above	40	40

Source: Published article in Eenadu daily news paper (11.01.2012)

to be highly suitable.

Water saving technology of drip irrigation (DIM):

Considering the importance of drip method of irrigation, a suitable use of irrigation afford being made to providing the adoption of DIM-1970 onwards in India. The water equipment saving of water and waters efficiency views from 12 per cent-84 per cent per ha over the convention method of irrigation in village crops, 40 per cent-81 per cent per ha in food crops and other commercial crops water saving where is from 40 per cent to 60 per cent per ha. It also is reducing half of the cost of cultivation and improving productivity of crops as compared to the same crops cultivated under flood method of irrigation (FIM).

The minor-irrigation technology closely developed in instead of drip irrigation over views about 80 crops has been found to be suitable to cultivation under sprinkler irrigation method (SIM). It can also be used successfully even cultivating paddy crops apart from grown crop such as millets pulses, wheat, sugarcane, groundnut, cotton, vegetables, fruits, flowers, spices.

Table 2 shows reducing cost of cultivation and improving productivity of crops as per the INCID 1994 report. Productivity increase due to drip method of irrigation was noticed over 40

Table 2 : Water saving and productivity gains under drip method of irrigation: India

Crops	Water consumption		Yield (tone/ha)		Water saving over FIM(%)	Yield increase over FIM (%)	Water use efficiency (yield/ha/mm/ha)	
	FIM	DIM	FIM	DIM			FIM	DIM
Vegetables	840	740	10.84	12.03	12	12	0.013	0.016
Ash gourd	840	740	38.01	55.79	12	47	0.045	0.075
Brinjal	900	420	28.00	32.00	53	14	0.031	0.076
Beet root	857	177	4.57	4.89	79	7	0.005	0.028
Sweet potato	631	252	4.24	5.89	61	40	0.007	0.023
Potato	200	200	23.57	134.42	Nil	46	0.118	0.172
Lady's finger	535	86	10.00	11.31	84	13	0.019	0.132
Onion	602	451	9.30	12.20	25	31	0.015	0.027
Radish	464	108	1.05	1.19	77	30	0.002	0.011
Tomato	498	107	6.18	8.87	79	43	0.012	0.083
Chillies	1097	417	4.23	6.09	62	44	0.004	0.015
Ridge gourd	420	172	17.13	20.00	59	70	0.041	0.116
Cabbage	660	267	19.50	20.00	60	2	0.030	0.075
Cauliflower	389	255	8.33	11.59	34	39	0.021	0.045
Fruit crops								
Papaya	2285	734	13.00	23.00	68	77	0.006	0.031
Banana	1760	970	57.50	87.50	45	52	0.033	0.090
Grapes	532	278	26.40	32.50	48	23	0.050	0.117
Lemon	42	8	1.88	2.52	81	35	0.045	0.315
Watermeloln	800	800	29.47	88.23	Nil	179	0.037	0.110
Mosambi*	1660	640	100.00	150.00	61	50	0.060	0.234
Pomegranate*	1440	785	55.00	109.00	45	98	0.038	0.139
Other crops								
Sugarcane	2150	940	128.00	170.00	65	33	0.060	0.181
Cotton	856	301	2.60	3.26	60	25	0.003	0.011
Cocount	------				60	12		
Groundnut	500	300	1.71	2.84	40	66	0.003	0.009

Note: * yield in 1000 numbers

Sources: INCID (1994) and NCPA (2001)

per cent in vegetable crops such as bottle gourd, potato, onion, tomato and chilies, whereas the same was noticed over 70 per cent in many fruit crops. In case of sugarcane productivity difference was also found to be over 33 per cent, the vegetable crops such as cauliflower, tomato and brinjal also suggested that productivity enhancement due to DIM was substantial.

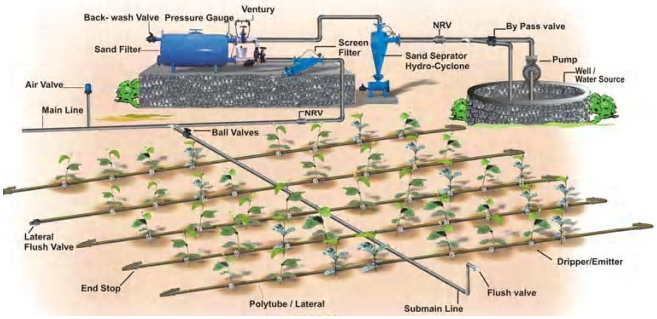

Fig. 1 : Drip mechanization

During the field survey the farmer as shown the erection of drips to his field in which red chilies, canakabaram flowers and dry cotton fields (Fig. 2-4).

Fig. 2 : Cotton crop under DIM

Fig. 3 : Red chilies under DIM

Fig. 4 : Canakabham flowers

Field survey results in drip irrigation:

The surveys have been examined in case of two types of fruits and other crops such has banana, grapes and sugarcane. The data of Table 3 are related to the 1998-99 and completed in the year 2001. The particular of the field surveys were majorly water consumption, productivity, electricity consumption. Water use efficiency cost of cultivation, gross income, capital cost of drip site(without subsidies), net present worth (without subsidies) and benefit cost ratio(without subsidies).A sensational gains my be noticed in two varieties of fruits and other crops, at the rate of 2.88 in banana, 1.767 in grapes and sugarcane accounted for 1.909. Importantly, an high soils of south Gujarat region suggests that a large scale adoption of can help to solve the problem of water logging and secondary which are increasing in this region. It is clear from the adoption of drip method of irrigation in crop cultivation, not only increases water saving and productivity of crops but also reduces the cost of cultivation and weed problems.

Sprinkler system:

It was introduced in Indian during the mid fifty for platoon crops like coffee and tea over the years the adoption of sprinkler like Haryana, Rajasthan, Madhya Pradesh, Maharashtra and Karnataka. According to the latest information compiled by the National Committee on Horticulture, the total area under sprinkler in country estimated to have increased to 1.60 m.ha. This is almost 300 per cent under the area under drip method irrigation.

Among the two micro-irrigation technologies, the research on sprinkler irrigation appears to have not much developed as compared to drip irrigation. Infact, the available results suggest that yield improvement and water saving in sprinkler irrigation is less striking. However, the trials conducted in different parts of the country revealed water saving due to sprinkler system varying from 16 to 70 per cent over the traditional method with yield increase from 3 to 60 per cent in different crops and agro-climatic condition. Water is sprayed into the air and allowed to fall ground surface somewhat resembling rainfall. The spray is

Table 3 : Field survey results of drip irrigation: banana, grapes and sugarcane

Particulars	Crops	Method of Irrigation		Benefit over FIM	
		DIM	FIM	In per cent	In value
Water consumption (HP/h/ha)	Banana	7884.70	11130.30	29.20	3245.60
	Grapes	3310.40	5278.40	37.30	1968.00
	Sugarcane	7167.00	3179.98	44.43	1412.98
Productivity (ql/ha)	Banana	679.50	526.35	29.10	153.20
	Grapes	243.25	204.29	19.10	38.96
	Sugarcane	1383.60	1124.40	23.05	259.20
Electricity consumption (Kwh/ha)	Banana	5913.33	8347.75	29.16	2434.42
	Grapes	2482.77	3958.78	37.28	1476.01
	Sugarcane	1325.25	2384.99	44.43	1059.74
Water use efficiency (HP hours/ quintal)	Banana	11.60	21.10	45.10	9.50
	Grapes	13.60	25.80	47.30	12.20
	Sugarcane	1.28	2.83	5.48	1055
Cost of cultivation (Rs./ha)	Banana	51437	52740	2.50	1303
	Grapes	134506	147915	9.10	13409
	Sugarcane	41993	48540	13.49	6547
Gross income (Rs./ha)	Banana	134044	102935	30.22	31109
	Grapes	247817	211038	17.40	36779
	Sugarcane	106366	85488	24.00	20878
Capital cost of drip-set (Rs./ha) (without subsidy)	Banana	33595	---	---	---
	Grapes	32721	----	----	----
	Sugarcane	52811	----	----	----
Net present worth (Rs./ha)	Banana	241753	---	---	---
	Grapes	540240	----	----	----
	Sugarcane	169896	----	----	----
Benefit-cost ratio* (without subsidy)	Banana	2.288	---	---	---
	Sugarcane	1.909	----	----	----
	Grapes	1.767	----	----	----

Notes: Banana and grapes data are related to the year 1993-94 and sugarcane data related to the year 1998-99* 15 per cent of discount rate was considered for computing benefit cost ratio.
Source: Computed using Narayanamoorthy (1997, 1997 a & b, and 2001 and 2012)

developed by the flow on the of water under pressure through small orifices or nozzles. The pressure is usually obtained by pumping. With careful selection of nozzle sizes, operating pressure and sprinkler spacing the amount of irrigation water required to refill the crop root zone can be applied nearly at the rate to suit the infiltration rate of soil. The components of a portable sprinkler system are shown through (Fig. 5) consistent of the following component.

The components of portable sprinkler system are shown through sprinkler system usually consists of the following components:

- A pump unit
- Tunings-main/sub mains and laterals
- Couplers
- Sprinkler head
- Other accessories such as valves, bends, plugs and risers.

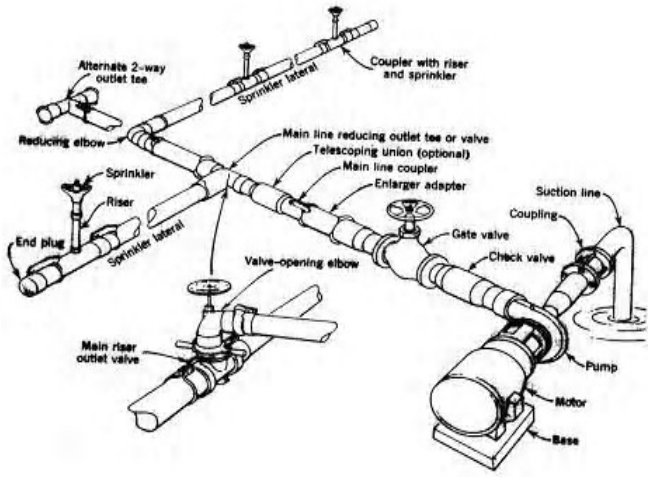

Fig. 5 : Component of a portable sprinkler irrigation system