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Scope of Drip irrigation for Vegetable Production in India

KEYWORDS: Drip irrigation, Intensive Management, Irrigation efficiency

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ABSTRACT *Irrigation is critical for successful summer vegetable production and it should be efficient and effective to avoid over or under application. The water use efficiency under conventional flood method of irrigation, which is predominantly practised in Indian agriculture, is very low due to substantial conveyance and distribution losses. Recognizing the fast decline of irrigation water potential and increasing demand for water from different sectors, a number of demand management strategies and programmes have been introduced to save water and increase the existing water use efficiency in Indian agriculture. One such method introduced relatively recently in Indian agriculture is Micro-Irrigation(MI), which includes drip method of irrigation. Micro-irrigation is proved to be an efficient method in saving water and increasing water use efficiency as compared to the conventional surface method of irrigation, where water use efficiency is only about 35-40 percent. Many factors influence appropriate drip irrigation management, including system design, soil characteristics, crop and growth stage, environmental conditions, etc. The influences of these factors can be integrated into a practical, efficient scheduling system which determines quantity and timing of drip irrigation. It provides the ideal vehicle to deliver nutrients in a timely and efficient manner and also achieving high water- and nutrient-use efficiency while maximizing crop productivity requires intensive management for commercial vegetable production.*

INTRODUCTION

There is a global crisis about water and its management. The crisis is significantly about availability of water for use and its highly uneven spatial distribution**.** The situation of water availability has changed drastically over the last 4-5 decades. Measures to increase water supply such as completion of storage dams, interlinking of rivers, desalination of sea-water and artificial recharge of groundwater and rainwater harvesting are costly and long term steps (Sipes, 2010). Agriculture accounts for a majority of global freshwater withdrawals and almost all in some fast-growing economy. At the global level more than two thirds of the blue water withdrawals are for irrigation. Irrigated agriculture represents almost a fifth of the total cultivated land but contributes more than one third of the total food produced worldwide and therefore it is of critical importance to sustenance of the human race. The rapid declining and dwindling of ground water resources cause a threat to farming community and forced to adopt better water management practices to get sustainable production. The concept of irrigation is as old as the human civilization; however there has been enhanced efficiency in the irrigation patterns over a period of time. Adoption of improved water management practices is an important need of the day. India's crop production suffers not only from drought but also from indiscriminate use of irrigation water. There is wastage of huge quantity of water with the present methods of irrigation which were in vogue.

Studies carried out across different countries including India have confirmed that irrigation plays a paramount role in increasing the use of yield increasing inputs and enhancing cropping intensity as well as productivity of crops (Vaidyanathan, et al.,1994). Apart from benefiting the farmers, irrigation development also helps to increase the employment opportunities and wage rate of the agricultural landless labourers, both of which are essential to reduce the poverty among the landless labour households (Saleth,2004;Narayanamoorthy and Deshpande,2003).However, water is becoming increasingly scarce worldwide due to various reasons (Rosegrant, et al., 2002). With the fast decline of irrigation water potential and continued expansion of population and economic activity in most of the countries located in arid and semi-arid regions, the problems of water scarcity is expected to be aggravated further (Biswas, 1993 and2001; Rosegrant, et al., 2002).

DEVELOPMENT OF DRIP IRRIGATION IN INDIA

Drip method of irrigation was introduced in India during the early seventies at the Agricultural Universities and other Research Institutions. The scientists at the Tamil Nadu Agricultural University (TNAU), Coimbatore, who are considered to be the pioneers in drip irrigation research in India, have conducted large-scale demonstration in the farmers' field for various crops, which received encouraging response from the farmers (INCID, 1994). However, the adoption of drip method of irrigation was very slow till Mid-eighties mainly because of lack of promotional activities from the State and Central governments. In spite of having the largest irrigated area in the world, India too has started facing sever water scarcity in different regions. Owing to various reasons the demand for water for different purposes has been continuously increasing in India, but the Potential water available for future use has been declining at a faster rate.

The agricultural sector (irrigation), which currently consumes over 80 percent of the available water in India, continues to be the major water-consuming sector due to the intensification of agriculture (Iyer, 2003). Though India has the largest irrigated area in the world, the coverage of irrigation is only about 40 percent of the gross cropped area because of the low coverage of irrigation is the predominant use of flood (conventional) method of irrigation, where water use efficiency is very low due to various reasons. Available estimates indicate that water use efficiency under flood method of irrigation is only about 35 to 40 percent because of huge conveyance and distribution

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losses (Rosegrant, 1997; INCID, 1994). The area under DMI has increased from a mere 1500 ha in 1985 to 70,859 ha in 1991-92 and further to 5,00,000 ha as of March 2003 (INCID, 1994; GOI, 2004).

The development of drip irrigation was very slow in the initial years and significant development has been achieved especially since 1990s. Due to various promotional schemes introduced by the Government of India. In irrigated vegetables production, it is important to reduce water loss through evaporation from the soil uncovered by vegetation. This can be accomplished by achieving rapid and uniform soil coverage through transplanting rather than direct sowing and choice of optimal density and planting geometry. In tomato, decreasing the row spacing from 0.7 to 0.5 m and 0.35 m increased fruit yield when drip irrigation was used. Micro-irrigation is also found to be reducing energy (electricity) requirement, weed problems, soil erosion and cost of cultivation. Investment in micro-irrigation also appears to be economically viable, even without availing State subsidy.

Table1: Water Saving and Productivity Gains under Drip Method of Irrigation: India.

Vegetable Crops	Water consumption (mm/ha)		Yield Tonne/ha		Water saving over FIM(%)	Yield increase over FIM(%)	Water use efficiency(mm/ha)	
	FIM	DIM	FIM	DIM			FIM	DIM
Ash gourd	840	740	10.84	12.03	12	12	0.013	0.016
Bottle 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	34.42	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	13	0.002	0.011
Tomato	498	107	6.18	8.87	79	43	0.012	0.083
Chilli	1097	417	4.43	6.09	62	44	0.004	0.015
RidgeGourd	420	172	17.13	20.00	59	17	0.041	0.116
Cabbage	660	267	19.58	20.00	60	02	0.030	0.075
Cauliflower	389	255	8.33	11.59	34	39	0.021	0.045

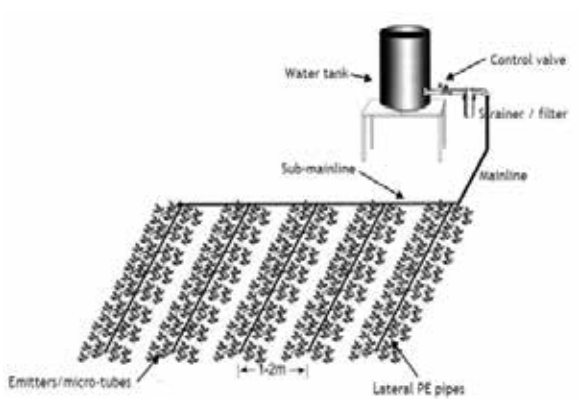
Source: INCID(1994) and NCPA(1990)

The table-1 shows that the productivity of different crops is significantly higher under DIM when compared to FIM. Productivity increase due to drip method of irrigation is noticed over 40 percent in vegetable crops such as bottle gourd, potato, onion, tomato and chillies, While reducing water consumption, it also reduces substantial amount of electricity required for irrigation purpose, by reducing working hours of irrigation pump sets (Narayanamoorthy, 2004).

A study of simple micro-irrigation methods done to improve irrigation efficiency on vegetable gardens by decreasing soil evaporation and drainage losses and by creating and maintaining suitable soil moisture conditions for crop growth. Evaluation of micro irrigation techniques on crops i.e. maize, tomato, rape, okra and cabbage was done under low-head drip irrigation, pitcher irrigation and subsurface irrigation using clay pipes. The study reported the mean best improvement in water use efficiency as 35.5% for subsurface drip irrigation treatments which was indicated to be significantly higher than other techniques (Batchelor et.al 1996). The positive impact of drip irrigation on soil quality, and on improving the capacity of agriculture to cope with power, labour and water scarcity. Findings indicate for a wealth maximizing impact on various kinds of farmers, it is very important to provide support to the farmers after the sales. (Vaibhav Bhamoriya and Susan Mathew 2014)

MANAGEMENT OF DRIP IRRIGATION

With drip irrigation water is conveyed under pressure through a pipe system to the fields, where it drips slowly onto the soil through emitters or drippers which are located close to the plants. Drip irrigation requires little water compared to other irrigation methods. Drip irrigation is a technique in which water flows through a filter into special drip pipes, with emitters located at different spacing. Water is distributed through the emitters directly into the soil near the roots through a special slow-release device. If the drip irrigation system is properly designed, installed, and managed, drip irrigation may help achieve water conservation by reducing evaporation and deep drainage.



Source: (RCSD 2008) Schematic design of a low-cost Drip irrigation system.

The principle that Irrigation can be closely matched to the crop

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water use on a daily basis is the overriding principle of drip irrigation and sets it apart from all other irrigation systems.

Water is applied directly to the plant root zone. With drip irrigation only the root zone of the plant should be wetted. Thus in the horizontal plane for row crops only the hill or bed is wetted, not the furrow area, and in the vertical plane the water is kept in the root zone by not allowing drainage below it. Elimination of irrigation run-off. Rainfall run-off should be much reduced as it can be stored in the dry soil between the drip lines. Reduction in water consumption due to drip method of irrigation over the surface method of irrigation varies from 30 to 70 percent for different crops (INCID, 1994, Narayanamoorthy, 1997; Postal, 2001).

CONCLUSION

With agriculture striving to increase crop yield while relying on a critical resource that is gradually diminishing, the need to increase Water Use Efficiency (WUE) becomes progressively more crucial. Little success has been obtained so far through genetic approaches to modify complex traits such as transpiration efficiency. This is partly due to our limited understanding of the molecular basis and physiological mechanisms regulating WUE in stressed and non-stressed plants. There are various irrigation techniques to enhance the efficiency of the applied water to the crop. Improving irrigation techniques can directly affect WUE by increasing the yield per unit of water applied and reducing the amount of water loss. Major improvements could be obtained through management and innovative design of integrated water delivery and application schemes. Innovative decision support systems integrated by sensor networks to monitor soil and plant water status will help farmers to efficiently allocate limited water resources.

REFERANCE

1. Batchelor. C, Lovell C. and Murata M., (1996) Simple micro irrigation techniques for improving irrigation efficiency on vegetable gardens, Agricultural Water Management, 32, , 37-48.)
2. Biswas, A. K. (2001).Water Policies in Developing World. Water Resources Development, Vol. 17, No. 4, pp. 489-499.
3. GOI. (2004), Report of Task Force on Microirrigation, (Chairman: N. Chandrababu Naidu), Ministry of Agriculture, Government of India.
4. INCID. (1994), Drip Irrigation in India, Indian National Committee on Irrigation and Drainage, New Delhi.
5. Iyer, Ramasamy, R. (2003), Water: Perspectives, Issues, Concerns, Sage Publications, New Delhi.
6. Narayanamoorthy, A. (1997), Economic Viability of Drip Irrigation: An Empirical Analysis from Maharashtra", Indian Journal of Agricultural Economics, Vol.52, No.4, October-December, pp.728-739.
7. Narayanamoorthy, A. (2001), Impact of Drip Irrigation on Sugarcane Cultivation in Maharashtra, Agro-Economic Research Centre, Gokhale Institute of Politics and Economics, Pune, June.
8. NCPA (1990), Status, Potential and Approach for Adoption of Drip and Sprinkler Irrigation Systems, National Committee on the Use of Plastics in Agriculture, Pune, India.
9. Postal, S., Polak, P., Gonzales, F., & Keller, J. (2001).Drip Irrigation for Small Farmers: A New Initiative to Alleviate Hunger and Poverty. Water International, Vol. 26, No. 1.
10. RCSD (2008): Low Cost Drip Irrigation Manual. Assam: Resources Centre for Sustainable Development
11. Rosegrant W. M.; Ximing Cai and Sarah A. Cline (2002), World Water and Food to 2020:Dealing with Scarcity, International Food Policy Research Institute, Washington, D.C., USA and International Water Management Institute, Colombo, Sri Lanka.
12. Sipes, J. L(2010). Sustainable Solutions for Water Resources: Policies, Planning, Design, and Implementation. John Wiley and Sons.
13. Vaidyanathan, A.; A. Krishnakumar; A. Rajagopal and D. Varatharajan (1994). Impact of Irrigation on Productivity of Land. Journal of Indian School of Political Economy, Vol.6, No.4, October-December, pp.601-645.
14. Vaibhav Bhamoriya, Susan Mathew (2014). An Analysis of Resource Conservation Technology: A Case of Micro-Irrigation System (Drip Irrigation) Centre for Management in Agriculture Indian Institute of Management, Ahmedabad .