

Auto Family Drip Irrigation System (AFDS) for Grow Bag Vegetable Cultivation**Chithra G.¹ and Binu John Sam²**¹Subject Matter Specialist (Agricultural Engineering), ²Senior Scientist & Head, Mitraniketan Krishi Vigyan Kendra – ICAR, Vellanad, Thiruvananthapuram, Kerala**SUMMARY**

Micro irrigation is an expensive venture. The social acceptability is also a decision making factor. Its large scale adoption involves a crucial question of economic viability. In recent times, farmers have been compelled to opt for this advanced method of irrigation, due to limited availability of water resources and high demand for water from all sectors. In spite of the technical and economic feasibility of drip irrigation, its adoption on large scale is not so encouraging in India. There are some limitations in the prevailing methods of drip irrigation like economic investment, clogging of drippers, low awareness level and inadequate knowledge about its application, utility, method of operation and maintenance. Keeping in view of the above few facts, a field experiment was conducted on automatic drip irrigation for grow bag cultivation to evaluate yield, water-use-efficiency and economic feasibility of a commonly used vegetables

INTRODUCTION

Vegetables available from market are not fresh and organic. Also, the cost of vegetables are high during off seasons. The shrinkage of land and acute water shortage are the other problems faced by farmers of Thiruvananthapuram district. Per capita land holdings in Kerala is less than 0.01ha i.e., farming is carried out by small and marginal farmers. Added to it, the need for having fresh produce have prompted people to utilize their terraces for cultivation using grows bags. More than 18,000 terrace gardens have been promoted since 2016 though such farming initiatives lack supervision and guidance particularly in field of irrigation. Consequently, during summer, plants face severe drought leading to plant wilting. The closure of stomata is the first indication of plant water stress. This is followed by the plant wilting and finally damage of the plant through overheating lading to crop loss. It is here that automatic drip irrigation helps to a great extent.

**Fig.1:- Automatic Drip Irrigation System for Grow Bag Vegetable Cultivation****Interventions****Process**

As a flagship programme, Kerala Mitraniketan KVK first introduced and initiated the Automatic DIS in Thiruvananthapuram corporations with an aim of more crops per drop. Starting from 2014 to 2018, KVK implemented the technology in almost all over Thiruvananthapuram. Front Line Demonstrations were carried out, by KVK, and as a part of Project funded by Kerala State Planning Board and Kerala Irrigation Infrastructure Development Corporation thousands of units had been installed in roof top vegetable gardens.

Technology

Automatic low cost drip irrigation system includes, among others, the drip kit, booster pump and timer. Total cost for the entire system come around Rs.3650/-. This low cost technology attracted people in urban and semi-urban areas to adopt the technology for roof top vegetable cultivation.

Automatic Timer

A convenient option in a drip irrigation system is an automatic timer. Battery powered timers let us set the frequency and duration of watering, and allows setting different watering schedules for different plants. With automatic shut-off, one need not be available at close proximity to shut off the system. Up to eight schedules can be set in the timer for the entire week. Timer out must be connected to switch board and timer in to the pump.

Booster Pump

0.2hp submersible pump is used to pump water from the tank to the laterals. Pump is needed when the tank is kept on the level of the terrace itself. Minimum pressure of 1 kg/cm² is required to obtain the desired discharge. If the tank is above the ground level, at a height of more than 2m, water directly flows by gravity. Connect 16mm lateral to pump to obtain the sufficient pressure.

Drip Kit

Drip kit consists of 16mm LLDPE lateral, dripper / emitter (4 LPH), stake 4 way assembly with micro tube, screen filter, fittings and accessories. Sixty numbers of poly bag can be irrigated by using this drip kit having a discharge rate of 1LPH / Poly bag. Screen filter, filter the water efficiently @ 700 litre per hour. Drip kit will last for more than two years without any damage.



Fig.2:- Field Monitoring – Drip Installed Field

Methodology

A comparative study was conducted to evaluate the performance of time based automatic drip irrigation system and manual hose irrigation in vegetable. Irrigation time optimized at 15minutes and provided 250 ml of water per plant. Based on the growth stage, crop water requirement of vegetables was estimated to be 0.6 to 2 litre/day. To meet this crop water requirement, irrigation was done at 4 time intervals i.e., morning twice and

evening twice in such a manner 1 litre water was irrigated per grow bag. Thus drip irrigation conserved 50% water compared to manual hose irrigation. It was found that drip irrigation gave 70% higher yield than the yield obtained with the manual drip irrigation system. Automatic DIS increased irrigation efficiency up to 95% than that of conventional method of irrigation.

Review of Literature

According to Kauluse A,et al (2016) preservation of water sources and minimizing wastage of it done by this effective system which will helps for better productivity of crops. These days adopting an optimized irrigation system has become a necessity due to the deficiency of the world water resources. Automated timer based system is comparatively cheaper and hence gaining more popularity than the volume based system (Rajkumar et al, 2008). In micro irrigation sector, manual interventions are automated to perform all operations, starting from watering to fertigation as per prescribed schedule. Development of automated system has resulted in lot of developments in crop production like improvement in water saving, increase in crop yield, enhancement in water as well as fertilizer use efficiencies and greater benefit cost ratio as well, in comparison to general micro irrigation system (Suresh, 2010).

Horizontal Spread

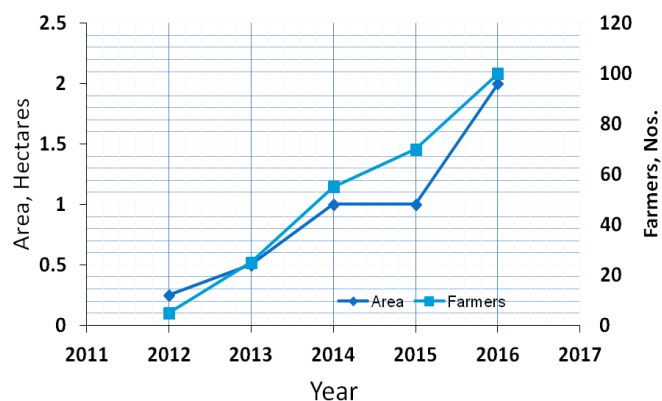
This being an automated system, efficient use was made by urban farmers. Most of the farmers are retired hands over the age of sixty. Hence the automatic system reduced drudgery and increased the horizontal spread of the technology. More over 1000 units had been implemented in Thiruvananthapuram. KVK as a part of extension work; published popular articles in “Kerala Karshakan” and “Karshakashree” – Monthly Agricultural Information magazines. KVK distributed extension literature to farmers while conducting training programmes .During ATMA monthly technology meetings, lectures were delivered to extension functionaries for the extra support to local farmers. Malayala Manorama documented the field work and telecasted the same in “Nattupacha” – agricultural information programme in Malayalam. Thr feedback from the farmers were that

- Reduction in water use by 30-70 percent
- increase in yields by 25 percent;
- Reduction in additional costs like fertilizers, labour, tilling and weeding.

Drip irrigation thus saves about 30-70 percent of water compared to flood irrigation and at the same time; appropriate application of fertilizer and other inputs in combination with drip system of irrigation have the potential to raise land productivity by 100 percent. This will also economize use of fertilizer by about 30-40 percent. Additional advantages of drip irrigation include reduction in weed growth, better quality yield, less labour requirement, less electric power consumption, early maturity of crops and applicability even with the use of mildly saline water.

Economic Gains

Parameters	Demonstration	Check
Water use efficiency	90	35-55
Yield (kg)/60 bags	198.4	123.6
Gross Cost (Rs)	7560	4634
Net Return (Rs)	3157	1421
BCR	1.42	1.33



The graph indicates the area covered and number of farmers adopted the drip irrigation system by KVK guidance.

Employment Generation

KVK trained technicians for the installation of Drip system in urban areas. 15 rural youth were equipped with hands on training in the implementation level. As a part of Urban Agriculture Project Programme KVK 450 famers were imparted training in field.

CONCLUSION

Time based Automatic Family Drip System (FDS) is observed to be user friendly, economical and cost effective as compared with conventional hose irrigation for farming on terraces in cities. 37.710% increase in yield was obtained against 90% water use efficiency, 50% water savings was observed for drip irrigation by avoiding the wetting of terrace with overrun water loss. Time savings, low energy consumption and low pressure low cost DIS had been widely accepted among urban farmers to promote vegetable cultivation in their own houses.

REFERENCES

- Akash Kaluse, Arvind Kadam, Vishal Patil and Sharad Dhage (2016) Automatic Drip Irrigation System. International Research Journal of Engineering and Technology: Volume: 03(Issue: 11): 696-698.
- Rajkumar, D. Raamah, K.Rathika S and Thiyagarajan, G, "Automation in Micro irrigation. Science tech Entrepreneur, 2008
- Suresh, R, "Micro irrigation". First Edition. Standard Publishers Distributors. New Delhi, 2010.