International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 08 Issue: 04 | April - 2024 SJIF Rating: 8.448 ISSN: 2582-3930

THE DRIP IRRIGATION SYSTEM

Mr. Mohak Anil Jadhav

Atma Malik Institute of Technology and Research, Shahapur

Mr. Yash Jagdish Jadhav

Atma Malik Institute of Technology and Research, Shahapur

Project Guid: Prof. Soniya Kadam

Atma Malik Institute of Technology and Research, Shahapur

Abstract

Irrigation can be defined as the process of applying artificial water to soil or land in order to promote the growth of agricultural crops such as corn and wheat. Water irrigation has a number of advantages,including an increase in crop yield, protection against famine, revenue generation, and the avoidance of mixed cropping. It also has advantages in navigation, hydroelectric power generation, and the creation of employment opportunities. It should be noted that irrigation has both advantages and disadvantages, just like everything else. Irrigation has a number of disadvantages, including the waste of irrigation water, formation of marshy lands, damp weather, and the loss of valuable agricultural land.

Drip irrigation is one of the surface and subsurface irrigation methods that we will discuss in this paper. We will also discuss the various effects and advancements in this technique that have occurred as a result of the research conducted. Last but not least, the significance and necessity of this system will be discussed Drip Irrigation system. It has huge ability for water and nutrient conservation. The main aim is to reduce water scarcity near root zone and reduce evaporation. The assessment of yield and water productivity of clementine trees, cotton, pomegranate cultivars etc. is discussed. Effect of Drip irrigation on economic factors, productivity, fertilization techniques and irrigation scheduling is studied.

The drip irrigation on several cash crops like cotton, jute, groundnut, etc. in different parts of countries like China, India, Japan, North Xinjiang, European countries etc. are discussed. The Assessment with season, geography, environment, availability of resources is systematically highlighted Improvement and future scope for sustainable development is discussed. Also the computational analysis of Drip irrigation methodology and technology is done in order to improve the productivity and minimize the efforts and use of resources. The modeling and monitoring of 3D flow of water under drip irrigation is also studied. The overall effort in the current review analysis is to develop an optimum methodology and technology to enhance the use of Drip irrigation in large scale cultivation and Production.

Key words:- Drip, Irrigation, Artificial Irrigation, Efficiency, Framers

Introduction: Drip irrigation system is a type of micro-irrigation system that is widely used around the world to
improve crop yields and to increase crop yield potential. It is the most recent irrigation method to be
developed. It is used as a surface and subsurface irrigation method, depending on the situation.
In surface irrigation, water is distributed to the agricultural land through small channels that flood

the area to a depth determined by the amount of water required. Hydraulic applications and distribution can be accomplished either by gravity or by pumping. When used on soils with low to moderate infiltration capacities and on lands with uniform terrain, this method is effective. It is further divided into three categories: flow and lift irrigation; perennial irrigation; and flood irrigation. Farmers have traditionally used this method to harvest their crops. However, because of the significant disadvantage of this practice was found to be ineffective due to water loss due to evaporation in the middle of the process

The land and water represent the country's fundamental requirements for agriculture and economic growth. The International Water Management Institute (IWMI) estimates that by the end of 2025, 1/3 of the world's inhabitants will face the absolute water shortage. A process of irrigation was considered necessary for rapid development of agriculture that consumes much than eighty percentages of an exploitable water supplies of world.

The overall productivity of the agricultural sector and the expected rate of growth in GDP rely largely on the sensible use of the available water supplies. In India, however, micro- irrigation techniques are actively supported by the national government, state governments, and several local and foreign non-governmental organisations (NGOs) by offering various forms of social, administrative, and technological support systems. Such innovations are marketed mainly a way to conserve water in the irrigated agriculture, it is a tool to raise income & alleviate hunger, to improve the food & nutrition welfare of poor households for one or several of the following purposes [1]. This Micro Irrigation Scheme (MI), which aims to increase the region using effective irrigation techniques viz. Irrigation by drip. Drip irrigation is the effective way for delivering irrigation water undeviating to soil in the plant's root region, reducing typical losses like shallow percolation, drainage, & soil erosion. Drip irrigation is more effective and inexpensive, unlike surface irrigation, if it is applied in water poor regions with undulated topography, deep & sandy soils & heavy-value crops with wide spacing [2]. This also allows fertilizers, nutrients, and other water-soluble substances to be used along with irrigation water, leading to higher yields & improved production results [3]. Thus, the method of drip irrigation is seen as a solution to several of the problem of dry land cultivation and increasing the output of irrigated agriculture. The path of several systems are being applied to facilitate the drip irrigation. Therefore, it is important for the drip irrigation farmers to know the advantages and restrictions of the method in the process of achieving higher output of the drip irrigation

The Drip irrigation is a form of micro-irrigation device that can conserve energy & nutrients by enabling energy to drip moderately to plant root, either from above the surface of the soil or buried underneath the surface [4-5]. The goal is to specifically inject water into the roots zone to reduce the evaporation. Drip irrigation systems use a network of pumps, tanks, tubes, and emitters to convey water. A drip irrigation system may be more powerful than other forms of irrigation systems, such as ground irrigation or sprinkler irrigation, based on how well it is built, installed, managed, and controlled [6-7]. Many large drip irrigation structures use some form of filters to prevent small waterborne particles from clogging the narrow emitter flow path. New technologies that mitigate clogging are now being offered. Any residential systems are built without extra filters as at the water treatment facility, potable water is still purified. Practically all makers of drip irrigation systems advocate using filters and do usually not respect warranties until this is achieved [8-9]. Owing to small particle settling and unintended injection of particles into the intermediate layers, last filters line just before a final transmission pipe will highly advised in addition to every another filtration device. Drip and surface drip irrigation is used

nearly entirely as the urban wastewater is treated. Usually, the rules do not require water to be pumped into the air that has not been thoroughly handled to the requirements of potable water. Standard surface formulations of timed-release fertilizer are often inefficient due to the current ways the water is treated in the drip system, because the drip mechanisms sometimes blend liquid fertilizer with the irrigation water [10].

It's called chemigation & fertigation (application of toxins & other substances to regularly flush out the body, like sulfuric acid or chlorine) using chemical syringe like diaphragm motors, aspirators or piston engines.

The chemicals can continuously have applied while the device irrigates at the intervals. From recent university field studies, the use of the fertilizer savings of up to ninety five percentage was recorded using drip fertilization and slow water distribution relative to accelerated discharge and micro-spray head irrigation. Properly planned, built and controlled, drip irrigation can help to accomplish water efficiency by minimizing evaporation and deep runoff relative to other irrigation types such as overhead or flood sprinklers, as water can have delivered more directly to the plants roots [11-13]. Additionally, drip can remove many diseases transmitted by contact with the vegetation through spray. Lastly, there could be no real water savings in regions where water sources are extremely reduced, but instead merely an increase in demand by consuming the same volume of water as before. The alternative approach is to spread irrigation water as lightly as possible in very arid areas, or on sandy soils.

Objective: Keeping all these in view, the present study was designed to study the extent of benefits derived from drip irrigation in horticultural crops and to identify the constraints encountered by farmers in adopting the drip irrigation for horticultural crops

In view of all these, the present research was planned to research the degree of advantages obtained from drip irrigation in horticultural crops and to recognize the challenges faced by farmers in the implementation of drip irrigation in horticultural crops.

• Drip irrigation aims to improve water usage in cultivation by distributing water & or minerals directly to the crop's roots via emitters.
• Ensure adequate moisture for plant development.
• Start providing crop protection towards drought in a limited time duration.

• Both soil and weather get cooled to create an optimal climate for the growth of the crops.
• Wash away the dilute toxic salts and unwanted soil chemicals from the roots region of the agricultural crops. • Drip irrigation is the main effective method for providing water and nutrients for the growth of the agricultural crops.
• It provides organic matter straight to the roots system of the crop, in the correct quantities, at the proper time so that every plant receives just what it required to develop optimally when it requires.
• Usually operated at reduced pressure than most other pressurized irrigation methods, thus reducing power costs.
• Foliage stays healthy, thereby reducing disease risk.
• Fertigation can be effectively implemented with minimum fertilizer loss.
• Supply differences may be controlled by regulating the valves and drippers unit(s).
• The labor costs are lower than other forms of irrigation.
• The water distribution is highly uniform, controlled by the output of each nozzle.
• Growth of the weeds are lessened and brought into control.
• Erosion of the soil is minimized.
• Soil type plays some less important roles in the frequency of irrigation

Water Requirement:

The irrigation water necessity of an area is based on following factors enlisted below: • Sort of Agricultural crops (Crop-coefficient) • Source of water that is to be used during the process of Drip Technique. • Data of the Weather and Climate (i.e. Evaporation Data) • Type of soil, wherein the crops are grown. • Cultivated area of the Agricultural crops.

Lay out of Drip Irrigation Technique:

• The main and sub-main pipes are usually spread around the slope, and the laterals are positioned along the slope.

• The laterals can be allowed to take off directly from the main pipe in a specific area of the agricultural field. • It may be best to split it into blocks and wide fields. Each block can have one Sub-main and a control valve. Lateral pipes are connected to sub-mains.

• Reasonable structure and components to ensure sufficient, consistent delivery of water (and fertilizer) through the field to fulfill crop requirements.

The considerations of the Lay out of the Drip Irrigation Technique:

• Operational

• Water Quantity

• Challenges faced to maintain the quality of the water • Economical

Use of Filters in the Technique of Drip Irrigation:

• The implementation of the filter is a crucial part of the drip irrigation techniques.

• Filters are used to reduce or avoid the potential inflow of suspended material into the water through the pipe spacing and dripping network.

• The sort of filter the farmers require depends on the consistency of the water and the drip system working speed.

• There is presence of four common filter types that include sand filter, panel filter, hydro-cyclone filter and disk filter.

• Each filter design is efficient for a particular particulate matter and form of suspended substance, for a particular flow rate, and has a limited capacity to capture sediments.

Methodology: The present study was conducted Dindigul district of Tamilnadu. The expost -facto research design was used for the study. A sample consisting of 30 drip irrigation farmers were selected randomly from the purposively selected three villages of R.P. Pudhur, Manjanaickenpatty and chatrapatti in Oddanchatram taluks, where in maximum area of horticultural crops is irrigated by drip method. The questionnaire was developed keeping the objectives of the study in the background, presented in non sampling area and then employed for collecting the required data from the respondents.

Table: (Benefits of drip irrigation

S NO.	Benefits of Drip irrigation farmer	No. expressing the advantage	
		Number (n=30)	Percent (%)
1	Saving of water	27	92.38
2	Saving of labour cost for irrigation	24	77.36
3	Uniform application	25	93.12
4	Improved quatily of produce	20	62.63
5	Easy method of irrigation	27	83.65
6	Decreased weed growth	19	74.21
7	Increased crop yeid	26	75.62

The above table revealed that majority of the respondents opined that saving of water (93.33 %) is major benefit of drip irrigation and followed by Uniform application (90.00 %), Easy method of irrigation (86.67 %), Increased crop yield(76.67 %), Saving of labour cost for irrigation(73.33%) Decreased weed growth(70.00%) and Improved quality of produce (66.67 %). Constraints encountered by the drip irrigation growers The constraints encountered by the farmers had possessed the problem of non-availability of quality material, no follow up services by drip agencies, high initial investment cost, lack of capital to cover maximum holding under drip irrigation and delay in sanction of loan, leakagethe present drip system

ADVANTAGES

- Fertilizer and nutrient loss is minimized due to localized application and reduced leaching
- Water application efficiency is high if managed correctly
- Field levelling is not necessary.
- Fields with irregular shapes are easily accommodated.
- Recycled non-potable water can be safely used.
- Moisture within the root zone can be maintained at field capacity.
- Soil type plays less important role in frequency of irrigation.

- Soil erosion and Soil salinity is lessened.
- Weed growth is lessened.
- Water distribution is highly uniform, controlled by output of each nozzle.
- Labour cost is less than other irrigation methods.
- Variation in supply can be regulated by regulating the valves and drippers.
- Fertigation can easily be included with minimal waste of fertilizers.
- Foliage remains dry, reducing the risk of disease.

- Usually operated at lower pressure than other types of pressurised irrigation, reducing energy costs

❖ DIADVANTAGES

- Initial cost can be more than overhead systems.
- The sun can affect the tubes used for drip irrigation, shortening their usable life. (This article does not include a discussion of the effects of degrading plastic on the soil content and subsequent effect on food crops. With many types of plastic, when the sun degrades the plastic, causing it to become brittle, the estrogenic chemicals (that is, chemicals replicating female hormones) which would cause the plastic to retain flexibility have been released into the surrounding environment.)[71
- If the water is not properly filtered and the equipment not properly maintained, it can result in clogging.
- For subsurface drip the irrigator cannot see the water that is applied. This may lead to the farmer either applying too much water (low efficiency) or an insufficient amount of water, this is particularly common for those with less experience with drip irrigation
- Drip irrigation might be unsatisfactory if herbicides or top dressed fertilizers need sprinkler irrigation for activation.
- Drip tape causes extra cleanup costs after harvest. Users need to plan for drip tape winding, disposal, recycling or reuse.
- Waste of water, time and harvest, if not installed properly. These systems require careful study of all the relevant factors like land topography, soil, water, crop and agro-climatic conditions, and suitability of drip irrigation system and its components.
- In lighter soils subsurface drip may be unable to wet the soil surface for germination. Requires careful consideration of the installation depth.

Components used in drip irrigation (listed in order from water source) include

- Pump or pressurized water source
- Water filter(s) or filtration systems: sand separator, Fertigation systems (Venturi injector) and chemigation equipment (optional)
- Backwash controller (Backflow prevention device)
- Pressure Control Valve (pressure regulator)
- Main line (larger diameter pipe and pipe fittings)
- Hand-operated, electronic, or hydraulic control valves and safety valves
- Smaller diameter polytube (often referred to as "laterals")
- Poly fittings and accessories (to make connections)
- Emitting devices at plants (emitter or dripper, micro spray head, inline dripper or inline driptube)

In drip irrigation systems, pump and valves may be manually or automatically operated by a controller.

Most large drip irrigation systems employ some type of filter to prevent clogging of the small emitter flow path by small waterborne particles. New technologies are now being offered that minimize clogging. Some residential systems are installed without additional filters since potable water is already filtered at the water treatment plant. Virtually all drip irrigation equipment manufacturers recommend that filters be employed and generally will not honor warranties unless this is done. Last line filters just before the final delivery pipe are strongly recommended in addition to any other filtration system due to fine particle settlement and accidental insertion of particles in the intermediate lines.

form of droplets. This head loss is achieved by friction/ turbulence within the emitter.

Drip and subsurface drip irrigation is used almost exclusively when using recycled municipal waste water. Regulations typically do not permit spraying water through the air that has not been fully treated to potable water standards.

Because of the way the water is applied in a drip system, traditional surface applications of timed-release fertilizer are sometimes ineffective, so drip systems offen mix liquid fertilizer with the irrigation water. This is called fertigation; fertigation and chemigation use chemical injectors such as diaphragm pumps, piston pumps, or aspirators. The chemicals may be added constantly whenever the system is irrigating or at intervals. Fertilizer savings of up to 95% are being reported from recent university field tests using drip fertigation and slow water delivery as compared to timed-release and irrigation by micro spray heads.

Properly designed, installed, and managed, drip irrigation may help achieve water conservation by reducing evaporation and deep drainage when compared to other types of irrigation such as flood or overhead sprinklers since water can be more precisely applied to

` the plant roots. In addition, drip can eliminate many diseases that are spread through water contact with the foliage. Finally, in regions where water supplies are severely limited, there may be no actual water savings, but rather simply an increase in production while using the same amount of water as before. In very arid regions or on sandy soils, the preferred method is to apply the irrigation water as slowly as possible.

Pulsed irrigation is sometimes used to decrease the amount of water delivered to the plant at any one time, thus reducing runoff or deep percolation. Pulsed systems are typically expensive and require extensive maintenance. Therefore, the latest efforts by emitter manufacturers are focused toward developing new technologies that deliver irrigation water at ultra-low flow rates, ie, less than 1.0 liter per hour. Slow and even delivery further improves water use efficiency without incurring the expense and complexity of pulsed delivery equipment.

An emitting pipe is a type of drip irrigation tubing with emitters pre-installed at the factory with specific distance and flow per hour as per crop distance.

An emitter restricts water flow passage through it, thus creating head loss required in order to emit water

- **WATER SOURCE**

The source from where water is drawn for irrigation, such as a well, pond, or reservoir

- **PUMP**

A device used to pressurize the water and provide the necessary flow rate for the system.

- **Filter**

Removes debris, sediment, and other impurities from the water to prevent clogging of the emitters and ensure the smooth functioning of the system.

- **Mainline**

The primary pipeline that carries water from the water source to the irrigation area.

- **Submain**

Smaller pipelines branching off from the mainline, distributing water to different zones or sections of the field....

- **Emitters**

Devices that release water in controlled amounts directly to the plant root zone. This can include drippers, micro-sprinklers, or micro-sprayers

- **Lateral Lines**

Tubes or pipes that deliver water from the submain to the individual plants or crop rows.

- **Fittings**

Connectors, elbows, tees, and other components used to join different sections of the pipeline together.

- **Pressure Regulator**

Maintains a consistent and optimal pressure level in the system, ensuring uniform water distribution.

- **Control Valve**

Allows for manual or automated control of water flow and system operation.

- **End Caps**

Used to seal the ends of lateral lines, preventing water leakage.

- **Flush Valves**

Openings or devices that facilitate the flushing of the system to remove any accumulated sediments or debris.

- **Monitoring and Control System**

Optional components such as sensors, timers, and controllers that enable precise control and monitoring of the irrigation system.

Component and operation

1. Water Source
2. Pumping System
3. Distribution System
4. Drip Tape (drip tube)
5. Injectors
6. Filtration System

METHODOLOGY

The present research was performed in the Tamilnadu, district of Dindigul. The study used the expost -element analysis method. A group consisting of 30 gout irrigation farmers were randomly chosen from the three R.P villages intentionally chosen. Pudhur, Manjanaickenpatty and chatrapatti in the taluks of Oddanchatram, where the highest area of the horticultural plants is irrigated by drip system. The survey was designed to hold the research goals in the context, introduced in non-sampling field and then used to gather the data from the respondents needed. The questionnaire used in this study was adapted from the previous English language literature, that was validated and subsequent changes were made before the final questionnaires that were required to be administered

Capacity of Drip System: The factors that plays crucial role in maintaining the capacity of the Drip System is listed herein:- • The water requirement for the process

of drip irrigation. • The operating hours required for actuating the process of drip irrigation on the agricultural crops. • Interval between two consecutive drip irrigation that is performed on the agricultural crops by the farmers. • Efficiency of the application of the water on the root portions of the agricultural crops. The drippers involved in the drip irrigation are closely installed to each of the root portions of the agricultural crops. The lateral involved by the drip irrigation technique is placed along each row(s) of the agricultural crops [14]. And the number of lateral placed at the row(s) of the crops are taken almost equal to the overall growth of the agricultural crops

. • In the case of the close growing agricultural crops, the entire agricultural area is required to be wetted and moisturized properly

• The drippers included in the drip irrigation technique is used to turn as a line source of the water rather than a point source, so that the dripped water directly falls in the root portions of the agricultural crops.

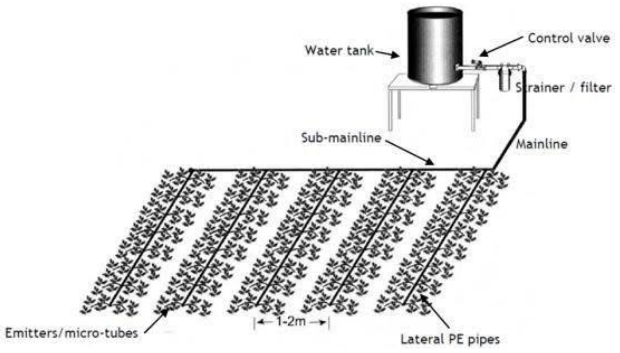
• However, in case of the closely spaced agricultural field crops, large number of the drippers are needed to carry out the drip irrigation technique.

• The process of operation and installation of such large scale drippers unit(s) are prone to many problems while used for a large period of time.

• Therefore, there is implementation of the emitting pipes inbuilt with dripper units placed at an optimal distance from each other along the lateral pipe(s) to carry out a preferred drip irrigation.

CONCLUSION

The advantages faced by the farmers are water-saving, standardized implementation & simple irrigation system, & the restrictions are the issues of the non-availability of quality content & the shortage of drip agent follow-u facilities. From the report, it is clear that the drip irrigation companies, funding organizations and others have sufficient model spare parts and other necessary steps to ensure a suitable situation for proper implementation of the drip irrigation systems. The findings showed that the majority of gout irrigation farmers had reported benefits such as water savings, labor cost savings for irrigation, improved yields, energy savings, labor savings, improved product quality, reduced weed production, expanded product self-life and standardized energy distribution. The challenges faced by the farmers had problems with the non-availability of good material, no drip agency follow-up facilities, high initial expenditure costs, lacks of funds to finance full holdings under drip irrigation, delay in loan penalties, and leakage in the new drip scheme.



REFERENCES:

- Larson, N., Sekhri, S., & Sidhu, R. (2016). Adoption of water-saving technology in agriculture:
The case of laser levelers. Water Resources and Economics, 14, 44- 64.
- PANDYA, P. A., & DWIVEDI, D. K. Constraints in Adoption of Drip Irrigation.
- Mulla, D. J., Perillo, C. A., & Cogger, C. G. (1996). A site-specific farm-scale GIS approach for
- reducing groundwater contamination by pesticides. Journal of Environmental Quality, 25(3), 419-425.
- C. Arun, K. Lakshmi Sudha "Agricultural Management using Wireless Sensor Networks – ASurvey"2nd International Conference on Environment Science and Biotechnology vol.48 (2012).
- Tigist Hilemariam Senbetu, Kishore kumar k, G.M. Karpura Dheepan, "IOT BASED IRRIGATION REMOTE REAL-TIME Engineering (IJITEE), May 2019.
- Jeonghwan Hwang, Changsun Shin, and Hyun Yoe "Study on an Agricultural Environment Monitoring Server System using Wireless Sensor Networks", 2010.
- Chiyurl Y.; Miyoung H.; Changkyu L. SWAMP: "Implement Smart Farm with IoT Technology". In Proceedings of the International Conference on Advanced Communications Technology (ICACT), Chuncheon-si,Gangwon-do, Korea, 11–14 February 2018.
- Dr.C K Gomathy, Article: A Web Based Platform Comparison by an Exploratory Experiment Searching For Emergent Platform Properties, IAETSD Journal For Advanced Research In Applied Sciences, Volume 5, Issue 3, P.No-213-220, ISSN NO: 2394-8442,Mar/2018
- Dr.C K Gomathy, Article: A Scheme of ADHOC Communication using Mobile Device Networks, International Journal of Emerging technologies and Innovative Research (JETIR) Volume 5 | Issue 11 | ISSN : 2349-5162, P.No:320-326, Nov-201