Drip Irrigation System: A Water and Nutrient Conservation Approach to Sustainable Crop Production

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Abstract— *Drip irrigation system is a most efficient and modern technique of irrigation, this method is used in those area where there is a scarcity of water, In this technique generally water and nutrient are allowed to deliver directly to the root zone by controlling the pressurised water through valves of the P.V.C (polyvinyl chloride) drip pipes in such a way that it systematically irrigate the whole field drop by drop directly to the root zone, and saves water up-to 70% as compare to flood irrigation method.*

Keywords— Drip Irrigation, Water Conservation, Nutrient Conservation, Crop Production.

I. INTRODUCTION

Drip irrigation is a modern concept of irrigation in which generally water and nutrients are allowed directly reached to the roots zone drop by drop in the right amount. As the name implies drip irrigation which means irrigation is done by drops of water. It is also known trickle irrigation or a micro-irrigation system.

FIGURE 1: Drip Irrigation System

In this modern era this modern facility of irrigation are generally adapted for irrigation because it is very effective and efficient method of irrigation, as it also have the potential to save enough amount of nutrients and water up-to 70%, by allowing water to deliver systematically directly to the root zone of the plants.

In drip irrigation system, specially designed P.V.C. or Polyvinyl hose pipes having a diameter 13-32 mm are generally used to install this modern irrigation system, through these pipes water are allowed to reach directly to the root zone drop by drop of the plants, and helps the plants to grow un-effectively and efficiently. The main objective of the drip irrigation is to place water directly into the root zone and minimize the evaporation rate.

II. HISTORICAL BACKGROUND

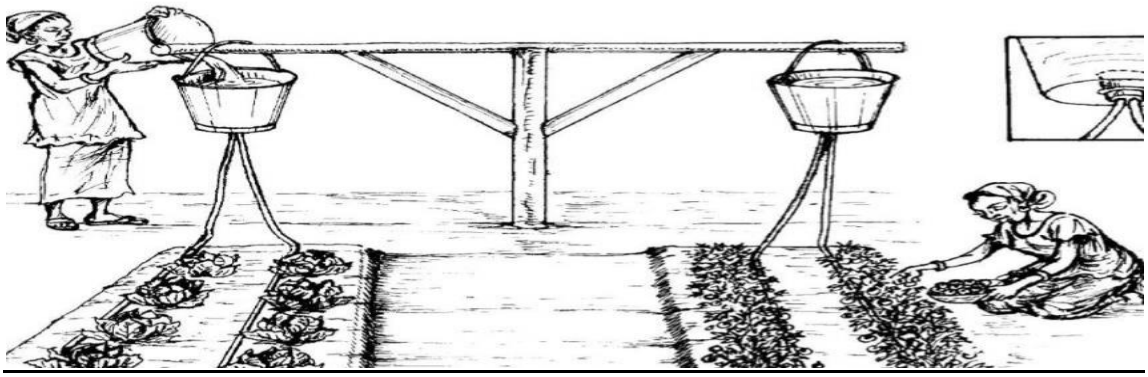

FIGURE 2: Ancient drip irrigation system.

Simcha Blass is known as a father of Drip irrigation system, this great invention has changed the world of agriculture by minimizing the use of water for irrigation and nutrients for development of plants. The very first Drip irrigation experimental system was established in 1959 by Simcha Blass, after 5-10 years he partnered later with Kibbutz Hatzerim in 1964, successfully they both created an irrigation company called Netafim.

This modern concept of irrigation was first adopted by Israel for cultivation, as there is a scarcity of water available in Israel, which is not enough for cultivation, to overcome this problem they adopt Drip irrigation method as this method consume less amount of water and nutrients and give good yield.

III. METHODOLOGY

FIGURE 3: Drip by Drip water reaches to the root zone.

Drip irrigation works by controlling the pressure of the water, which flows from the main water supply lines, tanks or a tube-wells to the drip irrigated pipes. With the help of drip irrigation system the pressurised water that diverts from the main line to the drip irrigated lines are controlled in such a way that drop by drop it irrigate the root zone of each and every individual plant through P.V.C pipes and saves the water in enough quantity and helps the plant to grow efficiently. Drip irrigation system was compiled with modern technology. After the installation it automatically controls the pressure of the water with the help of valves. Suitable pressure is used to irrigate the root zone of the plant accordingly; once the whole field get irrigated through drip system it automatically switched off the system which helps to prevent further loss of water.

IV. WHY DRIP IRRIGATION?

Drip irrigation system help:

- To save optimum amount of water and nutrients.
- It need less labour requirement as compare to other irrigation method.
- It efficiently utilise the water and nutrient with least loss as compare to other system.
- A chance of crop failure reduces.

- Drip irrigation helps to give better output in yielding.
- Less chances of weeds competition with crops.

V. REQUIREMENT TO SET UP DRIP IRRIGATION SYSTEM:

1. **Station Pump** - Takes water from the main source and deliver it into the Drip irrigated pipes with right pressure.
2. **Control valves**- These valves are specially designed to control the pressure and discharge of water in the entire drip irrigated system.
3. **Filtration system**- This system helps to clean the entire water which flow into the drip pipes.
4. **Fertilizer tank**- This tank help to add accordingly measured doze of fertilizer into the water during irrigation.
5. **Mainlines/ Sub-line**- These are specially designed P.V.C or polyvinyl hose lines having a diameter 13-32(mm) which is used to supply water from the control head into the fields.
6. **Emitter** - Emitter device are used to accurately control the discharge of water from the lateral lines to the plants.
7. **Pressure gauge** - In this irrigation system this device is used to measure the pressure of the water which was flow in the entire drip irrigation system.

VI. CROPS SUITABLE FOR DRIP IRRIGATION SYSTEM:

- ***Orchard*** – Grapes, Banana, Pomegranate, Orange, Mango, Lemon, Citrus, Guava, Pineapple, Papaya.
- ***Vegetables***- Tomato, Chilly, Capsicum, Cabbage, Cauliflower, Onion, Okra, Brinjal.
- ***Cash crops***- Sugarcane, Cotton, Strawberry.
- ***Flower***- Rose, Carnation, Gerbera, Orchids, Jasmine.
- ***Plantation***- Tea, Rubber, Coffee, Coconut.
- ***Oil-seeds***- Sunflower, Groundnut.

VII. MERITS:

- Crop grows consistently, healthy with good yield.
- It saves water up-to 70% as compare to traditional method of irrigation.
- It also enhances the yield of crop plants.
- It also minimizes the use of fertilizer doze.
- Cost of labour requirement, intercultural operations, Nutrients application also gets reduced.
- It also helps to enhance the infiltration capacity of the soil.
- Less chance of crop failure.
- Weeds are grown in less percentage.
- Minimize the effect of soil erosion.
- We can use recycled water efficiently.

VIII. DEMERITS:

- Initial investment is comparatively high to install Drip irrigation system.
- Having a high maintenance cost.
- Might be a chance of drip pipes leakage.
- Sometime P.V.C pipes are chocked or blocked.

- Need regular investment for replacing the Drip irrigation system entirely.
- Need high skilled labour to use this irrigation system.
- Solar radiation affects the pipes used in drip irrigation, and shortening their usable life.
- This method of irrigation is not suitable for closely planted crops such as Rice, Wheat etc.
- The establishment of this system is different for each and every crop, so it is also considered as expensive method of irrigation.

IX. CONCLUSION:

Drip irrigation system mainly used in dry-land areas, where there is a scarcity of rainfall and water, like arid and semi-arid region. To overcome this problem farmers have to adopt this modern irrigation technique in dry land areas and have to take a one step towards Drip irrigation system, as this system need limited amount of water to irrigate the whole field drop by drop and also have a potential to conserve 70% of water as compare to flood irrigation.

In my opinion this is the best method of irrigation for dry land areas, all arid and semi arid region farmers have to adopt this method of irrigation for the effective and sustainable production of crops and plants.

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