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Pitcher Irrigation: The Boon for Small Scale Irrigation

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SUMMARY

The 'pitcher' system saves water up to 98 per cent as compared to flood basin irrigation system. The rate of seepage of water from pitcher will depend on the type of plant and soil and climatic conditions around the pot. The movement of water is as a result of the uptake by the crops and it continues as long as the plants take it up and it evaporates. One of the advantages of using pitchers for irrigation is the result of their water saving capacity. To compare pitcher irrigation to flood or sprinkler irrigation one must correct for the fact that the scales are radically different. Pitcher irrigation is used for small-scale, while flood and sprinkler systems are for more extensive irrigation. Taking this into account, pitcher irrigation is still more efficient. The 'pitcher' system saves water up to 98 per cent as compared to flood basin irrigation system.

INTRODUCTION

Pitcher irrigation is used for small-scale, while flood and sprinkler systems are for more extensive irrigation. Taking this into account, pitcher irrigation is still more efficient. The 'pitcher' system saves water up to 98 per cent as compared to flood basin irrigation system. Buried clay pot irrigation (pitcher irrigation) has been used to grow a wide range of annual and perennial plants in China, Pakistan, India, Iran, Mexico, and Brazil. In fact, it is even recorded in Chinese texts dating back more than 2000 years. In its simplest form, pitcher irrigation entails burying an unglazed, porous clay pot next to a seedling. Water poured into pot seeps slowly into the soil, feeding the seedling's roots with a steady supply of moisture.

How Pitcher Irrigation Works??

- Pitcher irrigation uses water more efficiently than other systems since it delivers water directly to plant root zones, instead of to broader areas of the field.
- When a pot, filled with water and covered by a lid (wooden or clay), is buried in the soil, the water oozes out of the clay pot due to hydraulic head difference (moisture content difference) between the pot surface and the surrounding soil until it is in equilibrium with the surrounding area.
- The rate of seepage of water from pitcher will depend on the type of plant and soil and climatic conditions around the pot. The movement of water is as a result of the uptake by the crops and it continues as long as the plants take it up and it evaporates.
- When the surrounding area become saturated with water and the pot is emptied, water will tend to move back to fill up the pot. The system is therefore self-regulating.

Fig.1. Pot buried in soil in Pitcher Irrigation

- The surrounding soil is almost always at field capacity (approximately 80 per cent of soil pores filled with water) as long as the pot is not allowed to dry up completely due to evapo-transpiration.
- With this irrigation, deep percolation losses are negligible since water is released from smaller areas, and the rate of water loss can be controlled site to site by the amount of water put in each pitcher.
- Water requirements in a pitcher irrigated field can be even less than those of a drip irrigated system (of the same scale) due to the very low permeability of the pitchers, as well as reduced evaporation losses.
- The number of pitchers needed per hectare varies with the type of crop. A creeping crop such as bitter gourd requires 2,000-2500 pitchers per hectare. Upright crops, or crops producing a canopy around the pot require more pots, up to 4,000-5000 pots per hectare. Pitchers used for this purpose should have good seepage ability (minimum 15 per cent in 24 hours) in an open air. It was found that six to twelve liter pots are sufficient to grow most vegetable crops.
- Ideal for sandy to loamy soil with good porosity (40-60 per cent) and for small farmers, its cost is not more than Rs4500 per acre, which is about 82 per cent cheaper than the 'drop' and the 'sprinkler' irrigation method. Pitcher irrigation is used for small-scale irrigation where:
  - Water is either scarce or very expensive.
  - Fields are difficult to level such as under uneven terrain.
  - In remote areas where vegetables are expensive and hard to come by.

Advantages of Pitcher Irrigation:

- One of the advantages of using pitchers for irrigation is the result of their water saving capacity. To compare pitcher irrigation to flood or sprinkler irrigation one must correct for the fact that the scales are radically different. Pitcher irrigation is used for small-scale, while flood and sprinkler systems are for more extensive irrigation.
- Taking this into account, pitcher irrigation is still more efficient. The 'pitcher' system saves water up to 98 per cent as compared to flood basin irrigation system.
- A farmer can cultivate about 5 acres through pitcher irrigation on hand-pump, pond, or any simple source of water. This method is also efficient in terms of crop production per unit application of water.
- The corn grown in Mexico on pitcher irrigation showed that the crop production was much higher than that with conventional irrigation methods. Pitcher irrigation is useful for vegetables, gardening, landscaping, and growing plants in containers - on patios or porches, where the clay pot is buried in the planter box. It is also excellent for rooting cuttings.
- At least four plants of most vegetable crops could be grown around one pot. Limiting water delivery to the area where the crop is grown dramatically reduces weed growth - a major constraint on production in many areas of the world. The pots also may be refilled every few days instead of requiring constant attention.

Scientists at the Central Soil Salinity Research Institute have found that seven to ten litre pots are sufficient to grow most vegetable crops. The number of pitchers needed per hectare varies with the crop. At least four plants of most vegetable crops could be grown around one pot. A creeping crop such as bitter gourd required 2,000-2500 pitchers per hectare. Upright crops, or crops producing a canopy around the pot required more pots, up to 4,000-5000 pots per hectare. The profitability of pitcher irrigation must consider the labor of acquiring, burying, and filling the pots, in addition to the labor involved in managing the crop. Researchers at CSSRI found that the most profitable crops for pitcher irrigation in that area were (in order) Tomato> Bottle-Gourd> Bitter-Gourd> Watermelon> Cauliflower. The muskmelon was unprofitable, thus they do not recommend its cultivation with pitcher irrigation.

CONCLUSION

Research with pitcher irrigation at the Central Soil Salinity Research Institute (CSSRI) in Karnal India indicates that the amount of water which seeps out of the pots--and thus the number of plants which can be sustained by each pot--depends on the soil type, the porosity of the pot wall as well as the shape of the pot used.

Pitchers are generally placed at distances so that wet areas do not overlap. Soil moisture and salt distribution in the plant root zone are much more favorable with pitcher irrigation than with any surface method of irrigation. Under pitcher irrigation salt accumulates at the soil surface, leaving the salt content of water in the root zone more favorable than the salinity of water used in the pitcher. Thus even saline water can be used for irrigation in the pitcher irrigation system. Watermelon and muskmelon both tolerated water salinity levels of up to 12 dSm-1. A tomato crop yielded almost 29 t/ha at 12 dSm-1 with 5000 pots/ha. Note that water of good quality for irrigation has a conductivity below 2 dSm-1, while sea water has a conductivity of about 46 dSm-1.

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