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PITCHER IRRIGATION: A WATER SAVING TECHNIQUE IN ARID REGION

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ABSTRACT

Pitcher irrigation is an ancient and very effectual irrigation system employed in many arid and semiarid counties. Among traditional irrigation systems, pitcher irrigation is b one among the foremost efficient and compatible for little farmers in many areas of the planet. Well-organized water supervision using pitcher irrigation offers an answer to looming water disaster and would help bring more and more of the un-irrigated area under the irrigation within the country. Pitcher irrigation entails burying an unglazed, porous clay pot with in soil before seedling. Water poured into pot seeps slowly into the soil, feeding the seedling's roots with a gentle supply of moisture. Pitcher irrigation uses water more efficiently than other systems since it delivers water to plant root zones, rather than to broader areas of the sector.

KEYWORDS:

Pitcher irrigation;

Irrigation management;

Cost effective;

Arid region cultivation.

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Meeting the growing demand primarily requires optimizing agricultural production per unit area of land also unit volume of water application. However, water for irrigation is a very scarce resource in most parts of the world, more particularly in arid and semi-arid areas where there are extreme temperatures, uncertain rainfall, fast-depleting water resources, high rate of evapotranspiration, and high level of soil salinity (Bainbridge, 2001).

PITCHER IRRIGATION: AN OVERVIEW

Irrigation is a very important input for growing crops that require high water supply in agriculture. Application of water for agricultural purposes through man-made systems to supply water requirements not satisfied by rainfall (Stein, 1998). In some cases, application of water to land areas to meet both the water and nutrient ("Fertigation") needs of plants (Stein, 1998). The dramatic increase in world population has resultmore demand for food and nutrition security.

In the alternative, under such circumstances, some dry land countries have adopted certain water saving technologies like drip and sprinkler systems to irrigate their crops so that their scarcely available water resources will not be depleted. Here again, although such irrigation methods are known to save about half of the water presently used for surface or furrow irrigation, their technical, economical (high investment and operational costs), and socio-cultural factors have remained a serious hindrance from adoption, especially by small-scale farmers (Theib and Ahmed, 2004). The use of such techniques has thus been limited to commercial farms and to those areas with relatively plain landscapes or topographies that are relatively located in closer proximity to water points. As such, the large majority of smallholder farmers in those areas are still by and large deprived of irrigated farming and so much exposed to food and nutrition insecurity.

Understanding the condition, some dry land countries have accepted certain locally suitable water effectual technologies such as the clay pot pitcher irrigation method mainly to guarantee fruit production at household levels extensively across all landscapes and topographic regimes. Similarly, this is attempts to emphasize the role and implication, in terms of household food and nutrition security, of such ancient but yet neglected traditional methods of pitcher irrigation systems, more principally for socially inclusive household-level fruit production across the dry land parts of India.

Conservation and use of water is very important, especially for farmers in developing countries like India where water is often a major limiting aspect of agricultural production and development. To take benefit of the prospective year-around growing seasons of the tropics and

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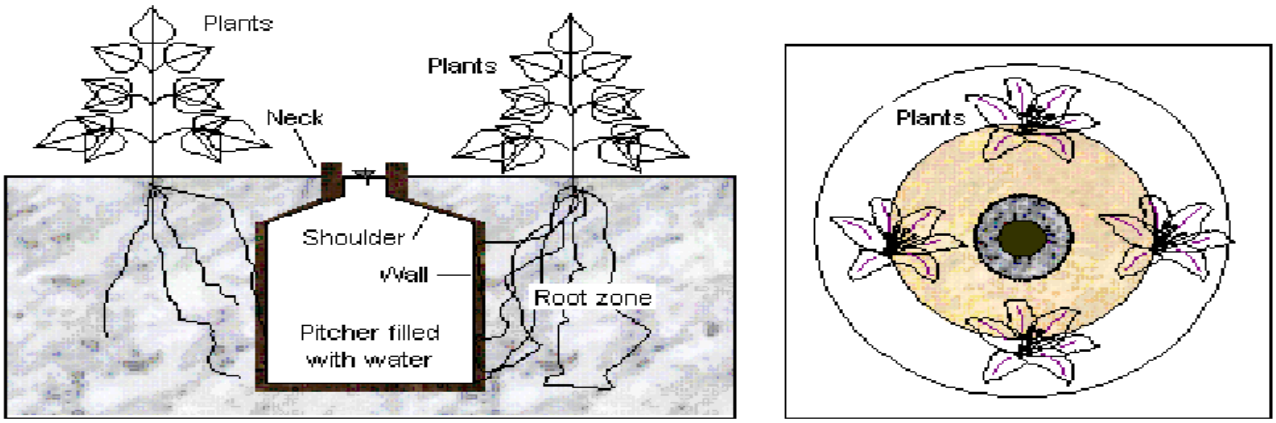
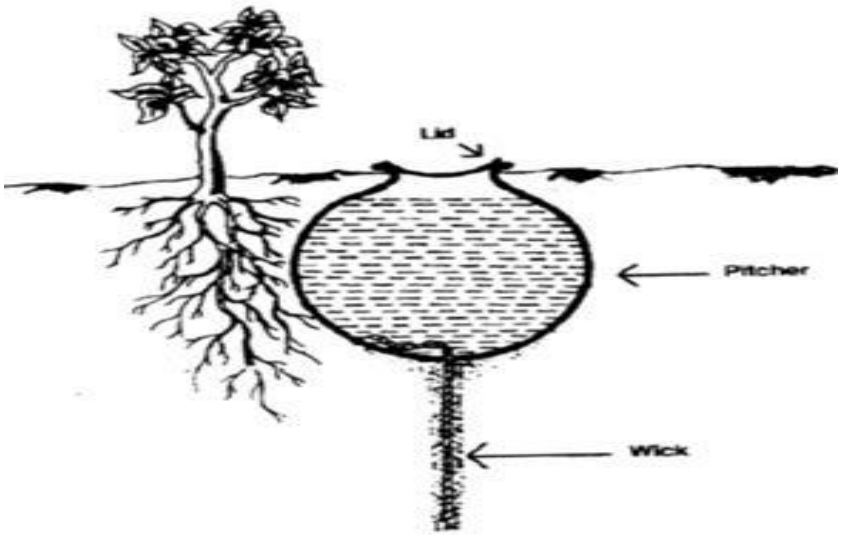
the resulting increased production, well-developed irrigation systems are often essential. A reliable supply of water is critical to intensive for crop production. When the farmer has an irrigation system, even though he may seem to have an unlimited amount of water, it should be used with care. Too much water, besides being a waste of energy and water will leach down through the soil and carry nutrients out of the reach of the roots of plants. Water run-off on a soil which absorbs water slowly will also wash away topsoil and nutrients.



Cross section of buried pitcher in the soil

Viewed from above

[Source: Research gate; uploaded by Budi IndraSetiawan]



[Source: Indian water protel posted by Rajshekar]

Plants grow in waterlogged soil may suffer for oxygen and the roots may rot. It is very essential for plants to have a good supply of water, especially in fruiting stage start. Transplanting of crop or plant is very sensitive to dry soil. The farmer may have to irrigate before planting to make sure the seeds or transplants have enough water to germinate and grow. Generally, water should be applied when the crop makes its fastest growth, especially if the soil moisture is low at the time. If pools of water form in an irrigated area, it is a sign that water is being applied faster than it can be taken in by the soil. This is wasteful, destructive and unnecessary. It should be definitely avoided. The farmer should take careful note of the weather before irrigating. A heavy rain following irrigation can drown out the crops.Also farmers have been unable to take advantage of the reservoir as there is no canal network to distribute water for irrigation. And even if there were, it would likely prove ineffective, as the water would simply be soaked up by the sand before reaching its destination.

In India a water resource are reducing slowly and continuesincreased pressure due to uncertain rainfall, a rising population, old and ineffective irrigation techniques, and dependence on water-intensive crop varieties. To get maximum crop productivity from each drop of water is observed as vital for the sustainability of the agriculture sector and food security. But achieving this goal will be difficult unless farmers switch to new methods such as pitcher and drip irrigation. State like Rajasthan, Madhya Pradesh receives sparse and erratic rainfall, per year average rainfall is also less, with the temperature hovering above 49 degrees centigrade from May to July.In this harsh climate, which could become even more extreme as the planet warms, villagers have had no access to canal water, ruling out crop cultivation in the past. Pitcher irrigation has made agriculture potential, helping in a new era for local farmers.The clay pot irrigation system is one of the most efficient systems of irrigation known and is ideal for many small scale farmers (Bainbridge, 2001; Mahajan et al, 2001; Lovell and Murata, 1998). Pitcher irrigation is an ancient technique that has been practiced in many parts of the arid world including India, Iran, African and South American countries (Mondal, 1974). Developed countries advanced micro-irrigation techniques such as sprinkler and drip irrigation are used progressively; many farmers in developing countries are unwilling to adopt these methods due to their high early cost of installation and costly maintenance. Traditional irrigation methods such as subsurface pitcher and porous clay pipe irrigation (Ashrafi et al., 2002; Qiaosheng et al., 2007; Siyalet al., 2009) are often preferred by poor farmers in small scale irrigation projects because of their low cost and high irrigation efficiency (Siyal, 2013).

Flood irrigation, water and water soluble nutrients going to spread downward and sideways but also move upward thanks to capillarity and surface evaporation, thus causing salts to accumulate at or near the soil surface. The accumulated salts may be harmful to crops that are consequently grown at the site, especially directly seeded crops because of their sensitivity to high levels of salinity during germination and establishment (Hussain et al., 1997; Mer et al., 2000; Roberts et al., 2009). Salt accumulation during subsurface clay pipe irrigation is a particular concern in arid regions where annual potential evapotranspiration (ET) is much higher than precipitation (Siyal,

2013). Thus, special management techniques are needed to stop salt accumulation and therefore the resulting harmful effects on germination or seed emergence (Hanson and Bendixen, 1995; Hanson, 2003).

The clay pot irrigation technology is a conservation irrigation system, which saves between 50% and 70% of water when compared to the conventional watering can irrigation system (Okalebo, et al, 1995). The clay pot system is therefore important when water conservation is crucial (Kefa, 2013). The buried clay pot irrigation maintains stable soil moisture, enables crops to grow in both soil or saline soils and is suitable for using saline waters not applicable with conventional irrigation (Mondal, 1974, 1983, 1984; Alemi, 1980; Mondalet al., 1992). By using this pitcher irrigation system and unusual water, the salt accumulates in the surface of soil and the moisture in the soil around the roots, the concentration of salts in the soil around the roots is reduced (Abu-Zreig and Atoum, 2004).

Clay pot pores allow the water to spread into the soil and making availability of moisture for crop growth. Water filled on the pot by weekly checkup and when required, thus maintaining a continuous supply of water to the plants. While burying the pitcher in the soil, farmers should take care to see that the neck region of the pot is positioned in such a manner that rainwater runoff does not enter into the pitcher. Otherwise small sand particles will block the pores of the pitcher. The main advantage of the wick which is attached at the bottom of the pot is to increase the water penetration into the soil and to deliver the water directly to the plant roots. The rate of water seepage from a pitcher depends on the type of plant and soil, and climatic conditions. When water level in soil is increase and soil become saturated water will soak back into the pot, filling it again. The system is self-regulating and water losses are negligible.

The number of pitchers required per hectare differs with the sort of crop. Creeping vegetables like cucumber, okra, eggplant, and bitter gourd need 2,000 to 2,500 pitchers per hectare, whereas upright and canopy crops, like beans, tomatoes, leeks, and melons, need up to 4,000 to 5,000 pots per hectare. The amount of water seepage from a pitcher depends on the age of plant and soil, and climate. Once the encompassing soil becomes saturated, water will soak back to the pot, filling it again this method of irrigation is ideal for sandy to loamy soil with good porosity. For small farmers, the system costs around Rs. 4,500 (nearly $48) per acre – about 80 percent cheaper than drip and sprinkler irrigation. The yield per acre is around 60 percent higher than with furrow and flood irrigation, which many farmers continue to use.A farmer can save 90 per cent of water as compared to flood irrigation. Fertilizers can also be mixed along with the water and poured into the pot. Weed growth has been found to be very minimal because water delivery is limited to the roots. Many farmers in the coastal districts are following this method. T get supreme crop productivity from each drop of water is stared as essential for the sustainability of

the agriculture sector and food security. Accomplishing this goal will be difficult unless farmers switch to new methods such as pitcher and drip irrigation.

CONCLUSION: Effective irrigation, water controlling and its suspicious use, by encouraging water-saving irrigation techniques – such as pitcher, drip and sprinkler irrigations – will help sustain food-production structures in our water-stressed country. Pitcher irrigation as asubstitute to drip or sprinkler irrigation can be a feasible option for water scarce area mainly for farmers those are looking to eke a living out of their small holdings of land.

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