CLAY POT IRRIGATION – AN INNOVATIVE TECHNOLOGY FOR WATER SAVING

R.P.Jangir
Director Research, S.K. Rajasthan Agricultural University

ABSTRACT

The arid region is a fragile ecosystem which encounters deficit and erratic rains, quite often, leading to droughts and famines. The biomass turnover is also poor and agriculture is a risky affair, receiving the annual rainfall of 180-300 mm in these parts. Apart from these, presence of excess salt in the ground water (60 % area in Thar desert) restricts its utilization for raising crops/ vegetables /fruit plants. Pitcher irrigation is a promising alternative due to its self regulated water flow correlated to changes in soil tension. Locally fabricated earthen pots (pitchers) having capacity of 5-6 litres with a height of 1 ft were buried in the soil on both sides of plant sapling to cater to the irrigation water requirement on demand. Water from these pitchers is being drained out through the pores of the wall. The technique is useful for growing vegetable or fruit plants. Initial establishment of arid fruit saplings (2-3 years) could be done through clay-pot irrigation, conserving water to an extent of more than 50% compared to the conventional surface irrigation techniques. It was found that saline water even up to 15 dS/m could be used to grow salt sensitive vegetable crops.

INTRODUCTION

Rajasthan has 1.16 per cent of India's water resources in the form of annual rainfall, against 10.4 per cent share in geographical area. In view of the erratic and untimely rainfall in the state, the surface water resources are exhausted before the commencement of the next rainy season and so groundwater remains the only source for fulfilling the requirements of agriculture and people. The exploitation of groundwater has reached alarming proportion. In 2008, out of 237 blocks in the state, 30 blocks were classified in safe category. The ground water development in the state has reached to 138%. Apart from these, presence of excess salt in the ground water (60 % area in Thar desert) restricts its utilization for raising crops/ vegetables /fruit plants. Pitcher irrigation is a promising alternative due to its self regulated water flow correlated to changes in soil tension[1]. Runoff water stored in underground storage tank (locally called *Tanka*) can be used for clay pot irrigation[2]. Arid zone agro-climate offers a great potential for production of high quality produce of arid fruits such as ber (*Zizypyus mauritiana)* and lasora or gunda (*Cordia myxa*). Under the present study for biomass generation and economic upkeep of rural poor, measures like growing vegetables in backyards and establishing small ber orchard through pitcher (clay-pot) irrigation by conjunctive use of rain water harvested in storage tank, and by bore well saline water were taken up. The data generated show that in conventional irrigation, water of 2-3 dS/m salinity could be applied to grow such crops[3]. It was found that saline water even up to 15 dS/m could be used to grow salt sensitive vegetable crops[4] under pitcher irrigation system.

MATERIALS AND METHODS

The underground water storage tank (also called/ Kundi / Kund) with a storage capacity 25,000-30,000 litres of water (Fig. 1) was constructed for rain water harvesting and storage of surface runoff from clean catchments around it. The catchments of the tanka were made by spreading the excavated material around the structure. A second layer of bentonite overlaid by 5-6 cm thick pond silt was spread and compacted to make a smooth and semi-impervious surface. A uniform slope of 2-3 per cent towards tanka is provided for harvesting maximum possible runoff.

Fig. 1: Rainwater harvesting

Pitcher irrigation is a promising alternative due to its self regulated water flow correlated to changes in soil tension. In this study, locally fabricated earthen pots (pitchers) having capacity of 5-6 litres (Fig. 2a) with a height of 1 ft were buried in the soil on both sides of plant (Fig. 2b) sapling to cater to the irrigation water requirement on demand. Water from these pitchers is being drained out through the pores of the wall. The technique is useful for growing vegetable or fruit plants. Initial establishment of arid fruit saplings (2-3 years) could be done through clay-pot irrigation, conserving water to an extent of more than 50% compared to the conventional surface irrigation techniques.

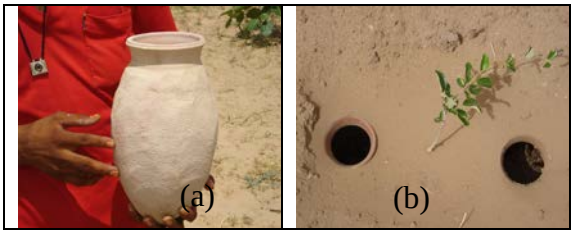

Fig. 2: Clay pot irrigation

RESULTS AND DISCUSSION

URMUL with financial assistance from Oxfan GB had initiated development of small scale orchards in 1600 m^2 area (1 bigha) each. Generally, 64 ber plants with 20-24 plants of lasora (*Cordia myxa*) at the border were established in Gram Panchayat-Krishnanagr Kulu Pabbuji, Tehsil -Phalodi (Jodhpur). To protect from stray cattle, the earmarked area was fenced with barbed wires as there is no other vegetation in the surrounding areas. Selected beneficiaries were small and marginal farmers belonging to schedule caste and minority communities. The pre-condition for the monetary support was to transfer the ownership of such horticulture plantation land in favour of woman (wife) to provide additional source of income to the poor women. Trainings were imparted to these farm women with respect to sapling transplanting, plant protection measures, pruning, post harvest technologies etc. at KVK, Bikaner and ARS, Mandor – Jodhpur of SKRAU, Bikaner. During initial establishment, they could harvest fodder from sewan grass, seed of *kharif* pulses as intercropped and seeds from tumba (*Citrulus colocynthesis*) as bonus returns. From fourth year onward, beneficiaries could start getting considerable returns from ber fruits, dried leafy fodder for sheep & goats and fuel from their pruning in the month of April or May every year. Considering the economic viability of these orchards, some farmers came forwarded and developed such orchards from their own resources. In about four to five years time, the farmers with one bigha mini-orchard unit could earn Rs. 15-18 thousand per annum from fruits, fodder, fire wood and green dry fodder in the fenced area. The ber fruits found ready markets in the local schools.

The expansion of such an indigenous technology could help to exploit naturally occurring saline ground water. Keeping this in view, IIT, Delhi in collaboration with ARS, Mandor took initiative to include some technical inputs in terms of pitcher design by increasing its size from 1.0' to 1.5' and its neck length from 3" to 9", expanding rain water harvesting area surrounding to the plant, soil/ vegetative mulching to check surface evaporation, re-installation of pitcher after monsoon recedes in October/November and irrigation through these pitchers with a mixture of stored rain water in tank or product water from MED unit with saline bore well water (3000-4000 TDS). URMUL, Phalodi, and School of Desert Science, Khejerli, Jodhpur are implementing these at 15 sites each. Encouraging results are observed in terms of higher sapling survival, better growth, deep root penetration and more total biomass production in the first year of the plantation. Systematic research studies have been initiated on salt exclusion/ retention from pitcher with different salt concentrations of irrigation water (normal rain water harvested, 2000 & 4000 TDS) under Rainfed Area Development Programme, GOI at ARS, Mandor- Jodhpur.

CONCLUSIONS

This technology is important in an area where vagaries of climate keep the people poor in the absence of water. People do not have resources for investing in agriculture or in any other activity. Setting up horticulture units with irrigation water suitably tailored to the site can bring new hope for economic upkeep of people in the desert. Such small horticulture units become functional by using simple technologies like use of pitchers irrigating horticulture plants. These units can be developed by very poor farmers with little land holding. The mini-orchard could support local people especially women in getting additional income by producing native fruits which are in good demand in the local markets. The raising biomass also improves the soil.

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