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A REVIEW ON DESIGN OF DRIP IRRIGATION SYSTEM FOR MANGO CROP

Sarvda Nand Tiwari[1], Rajesh Kumar Jatav[2] , Ranjeet Singh[3]

[1]P. G. Student, Department Of Agricultural Engineering, P K university, Shivpuri, Madhya Pradesh, India
[2]Assistant Professor, Department Of Agricultural Engineering,, P K university, Shivpuri, Madhya Pradesh, India
[3]Assistant Professor, Department of Mechanical Engineering, P K university, Shivpuri, Madhya Pradesh, India

Abstract - Dribble water system at a rate near plant water take-up requires low application rates (microdrip), which influence soil water system and plant reaction. This investigation think about the impact of three producer releases, 0.25, 2.0, and 8.0 L h−1, on various parts of the water system in every day dribble inundated corn (Zea Mays L.), depending on field perceptions and mathematical reenactments. Increasingly more consideration is being centered around saline water usage in water system because of the deficiency of new water to farming in numerous locales. For motivation behind decreasing the dangers of utilizing of saline water for water system, the instrument of soil dampness and saltiness dissemination and transport ought to be surely known for creating ideal administration procedures. In this paper, field tests were done at Junggar Basin, China, to contemplate the impacts of dribble water system water quality and trickle tape game plan on conveyance of soil saltiness and soil dampness. Six medicines were planned, including two dribble tape course of action modes. Contrasting water content conveyances and profundity toward the finish of the utilization of a similar measure of water near the producer, the driest profile is acquired for the most minimal application rate. Notwithstanding, when looked at sun oriented early afternoon speaking to the hour of the most noteworthy plant water request, the upper 0.20-m layer of the dirt inundated at the least rate was the wettest. Microdrip water system has decreased the dynamic changes in the water content during the day in the most dynamic aspect of the root zone. It additionally caused the littlest decrease in the reproduced water take-up comparative with the possible worth.

Keywords: Drip Irrigation, Water, Solar, Basin

I. INTRODUCTION

Irrigation is an artificial application of water to the soil. It is used to assist in the growing of agricultural crops, maintenance of landscapes, and re-vegetation of disturbed soils in dry areas and during periods of inadequate rainfall. Additionally, irrigation also has a few other uses in crop production, which include protecting plants against frost suppressing weed growing in grain fields and helping in preventing soil consolidation. In contrast, agriculture that relies only on direct rainfall is referred to as rain-fed or dry land farming. Irrigation systems are also used for dust suppression, disposal of sewage, and in mining. Irrigation is often studied together with drainage, which is the natural or artificial removal of surface and sub-surface water from a given area. Archaeological investigation has identified evidence of irrigation in Mesopotamia, Ancient Egypt and Ancient Persia (modern day Iran) as far back as the 6thmillennium BCE, where barley was grown in areas where the natural rainfall was insufficient to support such a crop. In the Zana Valley of the Andes Mountains in Peru, archaeologists found remains of three irrigation canals radiocarbon dated from the 4th millennium BCE, the 3rd millennium BCE and the 9th century CE. These canals are the earliest record of irrigation in the New World. Traces of a canal possibly dating from the 5th millennium BCE were found under the 4th millennium canal. Sophisticated irrigation and storage systems were developed by the Indus Valley Civilization in Pakistan and North India, including the reservoirs at Grinner in 3000 BCE and an early canal irrigation system from circa 2600 BCE Large scale agriculture was practiced and an extensive network of canals was used for the purpose of irrigation.

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Fig.1.1 Network of canals

1.1 Climate condition:

The irrigation research station suited at an elevation of 85 meter above sea level 25.87° North latitude and 81.15° East latitude and has a tropical to sub-tropical climate with extremes of summer and winter. During winter months average temperature ranges from 10°c to 15°C.

1.2 Drip Irrigation for Landscape and Garden:

Hundreds of thousands of acres of money-producing crops are now being irrigated exclusively with drip irrigation. Agricultural drip irrigation systems now have close to a forty year history since the early experiments began in Israel. Now with the experience gained through agricultural use, it is now possible for homeowners to better irrigate trees, shrubs, flower and vegetable gardens, ground cover, potted and hanging plants. Drip irrigation is now found in an increasing number of homes, highway and street median strips, and freeway landscaping, to mention just a few. The use of drip irrigation has dramatically increased as the public has been faced with rising water costs and scarcity of water. Drip irrigation now provides homeowners with an exciting plant watering concept that not only conserves water, but also accelerates plant growth. Drip irrigation is very adaptable and is successfully used in a wide variety of climates, soil types, plants, and growing methods.

II. REVIEW OF LITERATURE

This chapter deals with the review of research work have been done in the field of design of drip irrigation for garden and orchard. It covers the necessary aspects of installation of drip irrigation system, to increase production of crop, quality, production efficiency, cost of production and benefit cost ratio in conservative use of water. This part deals with research works on performance drip irrigation system with water saving plant growth and production are discussed below.

Battikhi and Abu Hammad (1994) reported that the drip irrigation had the potential to increase irrigation efficiency because the farmer can apply light and frequent amount of water to meet crop evapotranspiration needs. The irrigation efficiency ranges from 82% to 93% when the crop was grown in fields using surface drip irrigation system.

B.R. Habnson, G.Fipps, E.C. Martin (1996) conducted an experiment in U.S.A in 1996 which shows the yield is increased by using drip. It also helps in conservation of water.

T.B.S. Rajput and Neelam (2000) published a report on drip irrigation system. This includes the design of drip irrigation system and mentioned various design aspect of drip irrigation system and also studies about response of various fruit crops under drip system of irrigation.

Thomas Paul and Geeg Paul (2002) studied on responses and economics straw berry cultivation under drip irrigation with variable irrigation level they works on the effect of irrigation scheduling on marketable yield irrigation production efficiency in straw berry and obtained highest mean **marketable** yield when irrigation was applied 50% pan evaporation replenishment .

Mofoke *et al.* (2004), an affordable continuous-flow drip irrigation system was designed, and evaluated in Bauchi state, Nigeria with tomato as test crop. The system was designed to deliver the peak daily crop water requirement on a continuous basis throughout the day. The calculated continuous-flow rate was 9 drops of water per minute. The hydraulic design was based on a step wise use of the energy equation. The system was constructed exclusively from cheap and locally available materials, incorporating a modified form of the medical infusion set as emitter. Results of the system's evaluation revealed high Application Efficiencies in the order of 95, 96, 96, and 98% under continuous discharges of 9, 13, 17, and 21 drops/min respectively. The corresponding Irrigation Efficiencies were 94.0, 90.1, 91.0, and 88%. Measured Distribution Uniformity for the four treatments were 90.0, 91.4, 93, and 97% while the Adequacy of Irrigation were 92.0, 93.1, 94.0, and 98% for the four treatments in same order. Such high values of measured performance parameters indicate an excellent exploit of the continuous-flow system. Emitter clogging which is a common menace with drip systems was controlled fairly well by two improvised low-cost primary and secondary filters, and a weekly addition of sodium hypochlorite solution. The drip system has an initial cost of N 11,280 to N 48,480 (Rs.4240 to 15550) depending on materials used, and can irrigate 288 vegetable crop stands continuously for ten days without refill. This research therefore recommends a new dimension in affordable micro-irrigation technology that could assist developing countries to increase their food production several folds in a sustainable manner. The continuous-flow drip system also provides potential to accelerate poverty alleviation within rural communities of developing countries.

Edoga Rita Ngozi, M. O. Edoga (2005) The need for an affordable small scale irrigation system in most small

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gardens in Nigeria today is on increase and as a result an attempt has been made to design a drip irrigation set for small vegetable gardens. The drip irrigation set dimensionally consists of a main line diameter of 12.7mm, three lateral lines of diameter 19.05 mm and emitters of diameter 1.5 mm spaced 60 cm along the lateral lines. The emitters discharge rate was found to be 2.12 litres / hour and this will hopefully complete one irrigation of the area (5 m x 10 m) designed for 4 hours at peak consumptive use periods, employing two shifts of the three laterals.

Ella et al (2008) Assessment of the effect of topography and operating heads on the emission uniformity distribution in drip irrigation systems is important in irrigation water management and could serve as the basis for optimizing water use efficiency and crop productivity. This study was carried out to evaluate the effect of hydraulic head and slope on the water distribution uniformity of a low-cost drip irrigation system developed by the International Development Enterprises (IDE). The drip system was tested for water distribution uniformity under varying system heads and slope conditions. The laboratory experiments were conducted at the facilities of the College of Engineering and Agro-industrial Technology, University of the Philippines Los Baños. A drum reservoir served as water supply for the IDE drip system. A sub-main of 10 m and lateral-sub holder of 10 m with adjustable slope was fabricated to enable slope variations during laboratory experiments. The drip system was operated at pre-specified operating heads of 1.0 m, 2.0 m and 3.0 m for slopes of 0%, 10%, 20%, 30%, 40% and 50% for the sub-main and 0% slope for the laterals. The discharge in each emitter was monitored for each chosen slope through direct volumetric measurements. The water distribution uniformity was then evaluated using the Christiansen's method and the Merriam and Keller's method. Mathematical relationships were then developed to characterize the effect of slope and heads on uniformity coefficient. On the basis of the results, appropriate recommendations were formulated to minimize non-uniformity of water distribution under field conditions in sloping drip-irrigated lands.

Aali et al (2009) Up to day, drip irrigation systems have reached to a high level of technology. But, these systems are not able to show their potential benefits, due to various reasons. Emitter clogging can affect distribution uniformity and the system performance, which has direct relationship with water quality. In this study five types of emitters with different nominal discharges, with or without self-flushing system and with or without pressure compensating system were evaluated under three management schemes; untreated well water (S1), acidic treated water (S2) and magnetic treated water (S3) in order to reduce chemical clogging. Flow reduction rate, statistical uniformity coefficient (Uc), emission uniformity coefficient (Eu) and variation coefficient of emitters' performance in the field (Vf) were monitored. The emitter performance indexes (Uc and Eu) decreased during the experiment due to emitter clogging. The Uc and Eu values in different management schemes confirmed that the acidification has better performance than the magnetic water in order to control emitter clogging and keep high distribution uniformity. Regarding to Vf values, the priority of untreated and treated water was as S2>S3>S1 for each emitter.

Sah et al (2010)A manually operated low pressure low cost (LPLC) drip system was developed from locally available materials using KB pipes, KB pressure treadle pump, pressure drum with micro tubes and medical infusion set. The field experiments were conducted and effect of various independent parameters such as vegetative growth, hydraulic performance, crop water requirements, water use efficiency, and cost economics were evaluated on different aspects for tomato and broccoli. The developed system has payback period of one season only with benefit to cost (B/C) ratio of 1.59 to 5.31. Thus, appropriate, affordable, divisible, accessible, low operation and maintenance cost, user friendly LPLC drip irrigation system is a good alternative for small land holders.

III. CONCLUSION

Despite a significant increase of investment on the surface irrigation, the returns from this sector have been declining continuously over the period. If a significant portion of Irrigation allocation is diverted for propagation and coverage of Drip irrigation system, immediate and substantial benefits can be harvested. This will also help bring more area under irrigation which will further increase the production and productivity. For a sustained growth of drip and other similar technologies, the Government should immediately give the status of infrastructure to the Drip irrigation system. Such a policy initiative would act as catalyst for bringing about needed change in the basic social values regarding use of natural resources especially land and water.

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