DESIGN AND MANAGEMENT OF BUBBLER IRRIGATION SYSTEM

By

SALLY AHMAD AMIN AHMAD

B.Sc. Agric.Sc. (Agricultural Engineering), El Zagazig University, 2007

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SALLY AHMAD AMIN AHMAD

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This Thesis forM.Sc. degree has been approvedby:

Dr.Essam El-Din Wasief .....

Prof. of Agricultural Engineering, AgriculturalEngineering, Research Institute.

Dr.Abdel-Ghany Mohammad El-Gindy .....

Prof.Emeritus of Agricultural Engineering, Faculty of Agriculture, Ain Shams University.

Dr. Khaled FaranEL-Bagoury .....

Assistant Prof. of Agricultural Engineering, Faculty of Agriculture, Ain Shams University.

Dr.Mahmoud Mohamed Hegazi .....

Prof.Emeritus of Agricultural Engineering, Faculty of Agriculture, AinShams University.

Date of Examination: / / 2014

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SALLY AHMAD AMIN AHMAD

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Under the supervision of:

Dr.Mahmoud Mohamed Hegazi(Principal supervisor)

Prof. Emeritus of Agricultural Engineering, Department of Agricultural Engineering, Faculty of Agriculture, Ain Shams University

Dr. Khaled Faran EL-Bagoury

Assistant Prof. of Agricultural Engineering, Department of Agricultural Engineering, Faculty of Agriculture, Ain Shams University

ABSTRACT

Sally Ahmad Amin Ahmad: Design And Management of Bubbler Irrigation System. Unpublished M. Sc. Thesis, Department of Agriculture Engineering, Faculty of Agriculture, Ain Shams University, 2014.

This Research aims toobtain an adequate management for bubbler-irrigation system in order to overcome the problem of its field emission uniformity is low.

The Experiment was carried out at the experimental farm of the Faculty of Agriculture; Ain shams University, at Shalaquan village, Qalubia, Governorate, on (70% canopy) for Citrus crop as the total area of tree equal (5 X 5) m^2.

1- Bubbler irrigation system: Two Pressure heads 120 and 160 cm were examined then it is found the results as follow:

1- Field emission uniformity (F.Eu)

a- At lateral Line length 45m field emission uniformity 42% and 68% at pressure head 120 cm and 160cm respectively.

b- At pressure head 120 cm for acceptable uniformity 89% the maximum lateral line length is 30m.

c- At pressure head 160 cm for acceptable uniformity 62% the maximum lateral line length is 15 m

2-Irrigation requirement is 2868 m^3/fed/yr

3- Water use efficiency equals 0.5 kg/m^3

B-Drip irrigation system: by measuring irrigation requirement andWateruse efficiency it is found the results as follow:

1-Irrigation requirementsequal 2005m^3/fed/yr

2-Water use efficiency equals 1 kg/m^3

Key Words: Bubbler irrigation system, Irrigation management, Citrus crop, Drip irrigation, Evapotranspiration, Irrigation requirement, Head Loss

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1- INTRODUCTION

The first gravity- flow bubbler system was probably introduced by **Rawlins, 1977,** who developed the system at the U.S. Department of Agriculture, Salinity Laboratory in river side. **Yitayew et al. (1994)** showed that the name of the system bubbler was derived when the system operated from the fountain of water streaming out the hoses, and from the bubbling noise made as air escapes from the pipe lines.

They studied and reviewed an irrigation system which reduces the cost and water consumption. This system is Bubbler irrigation system which despite its simplicity and its many advantages it's the most difficult irrigation system in designing.

Bubblers typically apply water on a "per plant" basis. Bubblers are very similar to the point source external emitters in shape but differ in performance. Water from the bubbler head either runs down from the emission device or spreads a few inches in an umbrella pattern. The bubbler emitters dissipate water pressure through a variety of diaphragm materials and deflect water through small orifices. Most bubbler emitters were marketed as pressure compensating.

The bubbler emission devices were equipped with single or multiple port outlets. Most bubbler heads were used in planter boxes, tree wells, or specialized landscape applications where deep localized watering is preferable. The typical flow rate from bubbler emitters was between 2 and 20 gph **(Aung andSchere, 2003)**

Running of water in bubbler irrigation system depends on the effect of pressure caused by rising water column in the reservoir and the gravity by making a gradual slope in the land **(Yitayew et al, 1994).**

El-Lithy, 1998mentioned that it's important to use low-head Bubbler irrigation system as it gave higher flow rate and larger diameter of pipe used, resulting in fewer blockages, compared with trickle systems.

- Elaborate filtration equipment is unnecessary and the associatedhead loss resulting in increased pumping cost therefore it is eliminated.
- Quality of the water is not critical.
- Operate at low heads associated with lighter system components.

- Relatively low overall cost compared with other solid set system. Despite this bubbler irrigation had not widely been used, because of the following reasons:
- Lack of well-defined design procedure.
- Lack of manufactured watertight fittings,
- And also intricate installation.

Localized irrigation system is considered as the most system which decreases water consumption and it is the most frequently used in old lands in delta especially for fruit crops.

The objectives of this study are

1- Identify the effective factors on management.
2- Study the effect of pressure head in the tank on discharge of hoses and field irrigation uniformity.
3- Estimating irrigation requirement and interval.
4- To get the maximum lateral line length with the best uniformity distribution.

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2- REVIEW OF LITERATURE

2.1 Low head Bubbler irrigation system.

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2.1.1Application and general suitability.

In bubbler irrigation, water is applied to the soil surface as a little stream, typically from a small diameter tube (1 mm to 16 mm) or a commercially available emitter. Because of the application rates generally exceed the soil infiltration rates, small basins or furrows are needed to control the water distribution on the land. Although bubbler application is extensively utilized in landscape irrigation systems, its use in agriculture is currently limited. Two of the first long-term, operating bubbler irrigation systems were established in citrus groves at Tacna, Arizona and Riverside, California **(Rawlins, 1977).** Water to the systems was supplied from irrigation canals and distributed through thin-wall, corrugated polyethylene pipe to the bubbler tubes. By adjusting the elevations of the tube outlets, the gravity pressure water flow to each tree was equalized. Despite this early experimental success, the bubbler concept has not been widely adopted in agriculture. Perhaps one of the main reasons for the lack of interest is that design criteria and recommended operating procedures have not been readily available ***(*Yitayew et al., 1995).**