TECHNICAL ECONOMICAL EVALUATION FOR DRIP IRRIGATION COMPONENTS OF EGYPT

By

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ABSTRACT

The objective of the current study is to evaluate drip irrigation components used in Egyptian agriculture for both locally made and imported items . Twenty types of emitters, three types of both filters and fertilizer devices were considered . the experimental works was carried out at El-Harm , Dahshour, Ismailia, the Gezerate El-Dahab and Rashied sites , The obtained results indicated that, three types of locally manufactured emitters are not acceptable as $CV > 0.5$, eleven emitters on of which is locally made are good ($0.05 < CV < 0.1$) and six emitters all imported are very good . The vertical (imported) filter gave better performance, since it has less head losses and higher removal efficiency that the other two types of filters (imported horizontal and locally made vertical) when evaluated under the same operating conditions . Disc filters gave better performance compared with the screen filters . For fertilizer devices the results indicated that, the injection pump gave lowest fertilizing concentration and longest fertilization time . For economics of drip irrigation components, the results indicated that, using locally produced components save almost 75% and 71% compared with the cost of similar size imported items for tree and vegetable crops respectively.

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INTRODUCTION

1- INTRODUCTION

Drip irrigation is a system where water and fertilizers are applied on a frequent, intervals to prevent moisture stress in plant root zone. Drip irrigation system consists of an extensive network with a source of water , mainpipe line, submain pipes, and branches of laterals hose-pipe which carries the emitters. These emitters humid the soil in predetermined suitable rates under low pressure. The design of drip irrigation system for any farm requires a study of several factors on which the efficiency and success of this system depends on, one of these factors is the relationship between the operating pressure, and the corresponding discharge for the selected emitter, since the emitter is considered the heart of the system. Choosing the functional and most economical filtration system, as well as fertilizer injectors suitable for the emitters, are considered another important factors affecting the technical and economical performance of drip irrigation system. Selection of the proper components of drip irrigation system from the Egyptian market is mainly depends on the buyer experience as well as the capacity of sales persons in convincing the consumers. Accumulated experience through the last two decades indicated the risks involved in using unknown and unspecified components in the drip system on both farmers and operators. A lot of farmers and investors have suffered financially from the poor selection of various components of the drip system as a result of the absent of the needed information specially on the local manufactural parts. Evaluation of such components will provide useful information for designers, operators and farmers using drip irrigation system. Therefore, the aim of this work is to investigate the technical and economic parameters for the main components of drip irrigation used in Egyptian agricultural for both locally made and imported items.

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REVIEW OF LITERATURE

2- REVIEW OF LITERATURE

2.1. Definitions of Drip Irrigation System.

Many authors defined drip irrigation as the most efficient method of irrigation. It applies a controlled amount of water at low rate and more frequent.

Goldberg *et al.*(1976), reported that water is delivered to plants by means of drippers or emitters, hence the term drip irrigation is postulated. The water is applied at a very slow rate ranging from 2 to 8 L/h per dripper.

Marriam and Keller (1978), mentioned that drip irrigation is a system for supplying filtered water and sometimes fertilizer into the soil.

Bucks, *et al.*(1981), described the drip irrigation as a method of conserving both energy and water compared with sprinkler method.

Gilbert *et al.*(1981), mentioned that drip irrigation is a system for water applied by means of mains, manifolds and laterals, usually laid on the ground surface. Equally spaced along the laterals are drippers. Drippers are point sources of water operating at a low inlet pressure heads and small discharge.

Sammis and Wu (1985), mentioned that, drip irrigation system is often operated frequently (daily - or several times per week) to satisfy the evapotranspiration requirement for the crop.

El- Gindy (1989), reported that drip irrigation is a very slow method for applying water to the soil under low pressure drippers distributed along pipe placed near the plants.

2.2 Advantages and Disadvantages of Drip Irrigation .

Rawitz (1970), and **Bresler (1977),** reported that drip irrigation offers easy control of exact amount of water applied at each irrigation, control of timing and also the possibility of continuous irrigation. The time of day chosen for applying water by drip is not limited by wind -speed as in the case of sprinkler, and there is little interference with other field operations such as spraying or harvesting.

Hank and Killer (1972), found that the drip irrigation has also some disadvantages such as the need of clean water and low rate from each dripper with leads to a long time irrigation.

Robert (1974), observed some plugging under low flow of dripper.

Keller and Karmell (1975) and El-Gindy (1989), summarized the disadvantages of drip irrigation as follows :

* High maintenance cost.

* Salt accumulation near plants.

* Potential for clogging.

* Susceptible to insect and rodent damage (in relation to soft tubing).

* High installation cost.

* Restricted plant root development.

Seifert, *et al.* (1975), reported that trickle irrigation has resulted in considerable increase in water use efficiency (yield per unit of water applied) over furrow and sprinkler irrigation.

Another advantage of drip irrigation is the possibility of utilizing sewage water of secondary treatment and adequate filtration **(Oron *et al.*; 1979; Bilorai *et al.*, 1980).**

El-Gindy (1984), found that drip irrigation method increased the pepper yield 64 % over surface method with high water use efficiency.

Desai and Sudhaker (1993), summarized the general advantages of drip irrigation as follows :

* Water saving of up to 50 %.

* Yield increases of up to 30 to 100 %.

* 25 - 30 % saving in fertilizers.

* Improved quality of crop production.

* Reduce weed growth.

* Labor saving of up to 50 to 60 %.

* Utilization of poor quality water and/ or marginal soils.

* Energy conservation.

2.3. Components of Drip Irrigation System.

Keller and Karmeli (1975), and Vermeiren and Jobling (1980), summarized the components of drip irrigation system as follows :

1- Source of water.

2- Control unit.

3- Water distribution lines.

4- The emitters.

2.3.1. Emitters.

Bazaraa, A.S. (1982), Mentioned that the emitters can be classified according to several characteristics .

a- Flow regime: Three main flow regimes into which emitters can be classified according to Reynolds number Re, namely .

$$\mathbf{Re = VD / \nu} \qquad (1)$$

Where :

V : is the velocity (m/s).

D : is the diameter (m), and

ν : is kinemetic viscosity (m^2/s).

- laminar flow, Re less than 2000

- Unstable, Re between (2000 and 4000)