WATER BALANCE FOR SOME VEGETABLE CROPS UNDER SOUTH NILE DELTA CONDITIONS

BY

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Abstract

Experiments were carried out during the two successive season (1990/91 and 1991/92) using tomato, lettuce and squash planted in sand and clay lysimeters. The aim of the work was to study the actual water consumption of those crops in comparison with the calculated value based on evaporation data.The crop coefficient (Kc) was re-estimated in order to meet the actual water consumption.

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INTRODUCTION

1. INTRODUCTION

The Egyptian national supply of water from the Nile is around 55.5 billions cubic meter of water per year.In addition, around two billion cubic meters are available from the artisan wells. Meanwhile, The population is increasing already at the rate of 2.8% annually. Now, the population is around 57 million. The expected population after 25 years is 100 millions.

Accordingly, It is advised to evaluate new possible approaches to reduce the plant water requirement through the implementation of proper irrigation systems and agromanagement techniques. The other possible approach is to cultivate the crops in areas where potential evapotranspiration is lower, i.e., in north coast of the country .The corner stone for such policies is to determines exactly the amount of actual evapotranspiration (Et) for each crop for different regions. This will help to reduce the losses of water to make it available to cultivate more lands.

Three important crops were selected for this study,namely, Lettuce, Squash and Tomato where the yearly cultivated areas for each are 13539, 60567 and 394320 Feddan respectively. Lettuce is a leafy vegetables, squash is consumed as immature fruits and tomato is a full mature or ripe fruits. Hence, the these crops were selected to represent different types of economical vegetable groups.

REVIEW OF LITERATURE

2. REVIEW OF LITERATURE

The prevailing climate in Egypt indicates that water shortage is a real problem and serious yield limiting factor.

Different approaches were reported to handle the crop water requirements problem. One of the best reported methods in the use of water balance approach in which both the inputs and the outputs of water is calculated.

These studies were designed to first, estimate or measure the evaporation in the irrigation field, second, estimate the evapotranspiration in the said fields and accordingly estimate the water consumptive use, lastly, drainage have to be estimated before subtracting its value from the amount of irrigation water to establish the actual water use.

2.1. Methods of estimating evapotranspiration:

Evaporation has a major merit on consumptive use. **Pruitt and Angus (1960)** have determined evaporation by means of Class "A" pan evaporator (according to the united states water Bureau) located in large grass field and they used lysimeter to determine Et. According to **Young and Bloney (1942)** the places tanks were surrounded by natural growth of the same species, i.e., in their natural environment so that Et would presumably be the same as for similar growth outside the tank.

Israelson and Hansen (1962) stated that lysimeters have been proved successful in consumptive use measurements for water tables at various depths. Technical problems are encountered when lysimeter were used in the absence of water table. **Pruitt and Angus (1960)** have developed and used elaborate 20 Feet diameter weighing lysimeter for studying Et for rye-grass. **Van Bavel and Meyers (1962)** described on automatic weighing lysimeter utilizing strain gauges and electronic system for remote control.

Mcilory and Angus (1963) Indicated that a lysimeter should consist of a block of soil together with vegetation, if such a device was enclosed in a suitable container and exposed in natural surroundings, it will permit determination of any term of the hydrological equation when the others are known.

Tanner (1967), referred to the lysimeter as a volume of soil, which may be planted to vegetation, was located in a container to isolate it hydrological from the surrounding soil in order to assess or control various terms of the water balance.

The world meteorological organization (1966) used the term evapotranspirometers or soil evapometer for containers of soil and vegetation from which the water loss was measured by weighing or accounting for all incoming water at the surface and all outflow from the bottom of the container.

2.1.1 Temperature, radiation based methods:

2.1.1.1 Blaney Cradle Method :

$$Et = C\,[P\,(0.46T + 8)] \ldots\ldots \text{ mm/day}$$

where

Et = reference crop evapotranspiration in mm/day for the month considered.

T = mean daily temperature in °C over the month considered.

P = mean daily percentage of total annual daytime hours.

C = adjustment factor which depends on minimum relative humidity, sunshine hours and daytime wind estimates.

A strong correlation existed for a given climate between Et and Blarney Cradle factor (Tanner, 1967).

2.1.1.2 Radiation Method :

$$Et = C\,(W.Rs) \ldots\ldots\ldots\ldots \text{ mm/day}$$

where

Et = reference crop evapotranpiration in mm/day for the period considered.

Rs = solar radiation in equivalent evaporation in mm/day

W = weighting factor which depends on temperature and