

INTRODUCTION

Much work has been done in recent years on both the theoretical and practical approach to irrigation needs. It may be said, however, that there is still no one approach that is accepted universally in the calculation of irrigation need.

It is with this in mind that the writer set out to examine the literature and to investigate the possibilities of bringing in a simple method of calculation of irrigation need for market garden crops.

Work at the Imperial College of Tropical Agriculture in recent years by Smith (1959a) into the need of irrigation in Trinidad and other West Indian islands has opened people's eyes to the fact that in many years irrigation is a necessity during the months of the dry season in order to get economic crop production.

Following on from this Smith (1959b) has evolved a fairly simple method for the calculation of irrigation need in Trinidad, using as his test crop savannah grass (Axonopus compressus). Good agreement was obtained between the calculated soil moisture deficit and the actual deficit. However, it must be realised that using a grass crop, complete cover of the ground generally occurs for the greater part of the plant's life. With many market garden crops, however, a complete cover of the ground may never occur during the life of the plant, and, if it does, then it may be for only a short period of the plant's life.

It was with this in mind that the lettuce plant (Lactuca Sativa) was chosen, to see if calculated soil moisture deficits could be maintained under very different conditions from the grass crop.

The amount of ground left uncovered in the crop must of course play a large part in introducing an error into the calculations, and it was for this reason that bare ground plots were maintained alongside the lettuce plots to see if any constant could be determined showing the relationship in evapotranspiration between land partly covered with a green crop and land left completely bare.

The lettuce plant was also chosen because of its shallow rooting

habit which depends to a large extent on a high soil moisture status or so it is maintained.

It was decided to add to the irrigation treatments, a nitrogen treatment as previous work with lettuce (Wong 1959) on the College New Farm had failed to show any response from increased nitrogen dressing. This is found to be contrary to what is expected.

Marshall (1936) reviews 39 experiments on the effects of soil moisture status on plant growth, and out of this number 16 responded to differences in the soil moisture regime. This suggests that for the majority of plant species there is an optimum soil moisture regime, within which they will grow more vigorously, all other factors being non-limiting.

Similarly Beyer (1948) compares numerous experiments carried out on different plants, which suggest that maximum growth and yields are obtained when the crop is irrigated at a moisture tension well below that corresponding to the permanent wilting percentage. Beyer considers that irrigation of a crop can be controlled by one or a combination of some of the methods shown below:-

- A. Appearance of crop
- B. Irrigation tests
- C. Soil moisture
- D. Resistance blocks and tenderness
- E. Meteorological data.

It is naturally the latter with which this report is concerned.

Taylor (1951) calculated a single value representing the seasonal soil moisture regime, the seasonal moisture tension, and related this to yields of alfalfa, sugar beet and potatoes. From his results it was found that the yield was reduced as this tension increased. This suggests that moisture is not equally available to plants throughout the entire plant growth range from field capacity to permanent wilting point.

From these references can be seen the necessity for an efficient method of calculation of soil moisture, taking into account the variable physical factors of every crop and the kind of soil on which the crop is grown. Thus there is a need to determine the amount of water available