CHAPTER I

INTRODUCTION

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The continuous growth of the world population represents an associated increase in demand for food and clothing too. It is expected that there will be 6 billions people in the world in the year 2000. The expected increase in the demand for wheat, rice, maize, root and tuber crops and other agricultural products will be more atleast 80 per cent of the present level. Maize occupies about 11.2 per cent of world crop-land area and accounts for about 16.1 per cent of the world crop calories. In general, maize ranks third after wheat and rice among all crops for food-supply to the people in the world.

Eastern part of India (subtropical humid region), a mono-cropped rice dominated area, gets a high rainfall during kharif (July-October), a short spell of winter rain (November-March) followed by hot winds, and occasional rains during summer season. The soil is mostly alluvial, deep and fertile and is also having sufficient ground water. High rainfall and poor drainage system provide a situation for growing mainly rice crop during the kharif season. Even during rabi season under assured irrigation, rice comes forth at first preference. It is a well known fact that rice requires more water, has low water use efficiency and can be substituted by any other cereal having less water requirement during the rabi season. The area under maize in this part of the above mentioned region is less than one per cent.

Enhanced irrigation facilities and availability of high yielding varieties of maize made its cultivation feasible in the winter season, particularly in those regions where this crop is yet to find a place in the existing cropping system. However, the survey of earlier literature reveals that little has been done to explore the possibilities of growing maize in winter season in the humid subtropical conditions.

In many parts of the world the most important constraint in agricultural development is the limited availability of irrigation water, and even if water is available it is not being used efficiently in crop production. It is probably fair to say that most crops suffer some-times in their life cycle, atleast from short periods of water shortage, even in locations where rains are limiting not in the total amount, but from timely distribution.

Environmentally induced water deficits have long been recognized as one of the chief limitations for maize production in many areas. Even a mild drought during the critical stage(s) of crop-growth can drastically reduce the seed/ear production. The frequent occurrence of this problem in the semi-arid humid subtropical regions, therefore, makes it logical to initiate a thorough investigation of the impact of water deficit on different growth-stages of maize.

It is an established fact that for attaining maximum crop yields, the soil moisture supply should be adequate throughout the growth period. In general, the role of water for plant growth and development is very well documented. Sensitivity of maize grain development to moisture stress is related to the physiological stage of development. For this reason the time when moisture stress occures is important in determining final grain yield; hence timing of precepitation or irrigation becomes an important economic factor in maize production. However, with regard to the effects of water deficit at specific growth stages of maize, enough has not been done under subtropical conditions. Further, the available information is very much diverse and debatable with respect to the critical stage(s) of maize to water deficit.

Evapotranspiration during the life cycle of the plant is reported to be comparatively low during the vegetative stage, while it is maximum during the period from tasselling to grain filling; hence, it can be reasonably postulated that the yield and water use efficiency may be increased through efficient scheduling of irrigation with due consideration to the seasonal evaporative demand and crop susceptibility to water deficit during different growth stages. This is another area offering excellent scope for testing the

above hypothesis and for developing suitable irrigation schedule for maize.

The plant growth and soil moisture depletion approaches for scheduling of irrigation have been in vogue in the past. However, both these approaches have certain limitations or these are costlier and can not be adopted by the Indian farmers. The recently developed climatological approach, i.e., IW/CPE (Irrigation water applied to cumulative pan evaporation) seems to be simpler and has high extension value. Therefore, in the present investigation the irrigations were time-based upon the different IW/CPE'S. It is also known that under limited water supply the nutrient uptake may decrease as a consequence of the reduced plant growth.

Fertilizer is another important but costlier input which needs scientific management for obtaining maximum production at minimum cost. In general, the nutrient requirement of different crops varies under different soil types, climatic conditions, water availability and other management practices. The role of nitrogen, phosphorus and potassium are well established for plant-growth and development. Scientific information on the nitrogen, phosphorous and potash requirements for winter maize is available under those regions where this crop is well adopted. However, very little information is available on these aspects under subtropical humid region where this crop is not generally grown. Thus,

efforts were made in the present investigation to develop suitable scheduling of irrigation for enhancing the water use efficiency and also to find out the optimum requirement of nutrients for maximum grain production in maize.

A series of experiments was planned and carried out with the following specific objectives:

1. To identify suitable irrigation schedules based on pan evaporation during different growth stages.
2. To evaluate the crop response to delayed irrigation during different reproductive stages.
3. To study the effects of irrigation scheduling and fertility levels on water requirement, growth, yield and nutrient content of maize.