

I N T R O D U C T I O N

Past investigations into the way in which a crop responds to its environment have rarely involved more than a study of the differences in final yield resulting from changes in plant and crop environment. In recent years field crop research workers have begun to examine the factors and processes causing variation in crop yield.

Extensive studies of plant growth and of plant response to varying conditions have added much to our knowledge. The technique of growth analysis, in which quantitative measurements are made on plants at regular intervals during growth, has been a useful step in the examination of plant and crop development. Through further interpretation of results from this type of investigation, the underlying physiological causes of variation in yield have been deduced (Watson 1952). Growth analysis techniques can only be regarded as one facet of field experimentation. A further investigation of all the interacting factors affecting the growth of plants within a community is necessary before the true nature of the plant and crop yield determining processes is discovered (Donald 1963).

There is still a need for growth studies to be carried out on plants growing in a wide range of both ecological and macro-climatic environments. The information gained from this type of work will contribute towards our understanding of interplant competition and of the effect of differing climatic situations on interplant relationships.

The ecological situation of a plant within a crop may be varied experimentally by altering the number of plants per unit area. With crops in which yield is a function of vegetative growth, altering the environment in this way produces a definable response in final yield per plant and per acre. The relationship between plant population and yield per unit area may be described by an asymptotic curve (Holliday 1960a). It has also been shown (Holliday 1960b) that this form of response is found in a wide range of crops growing in different climatic environments. Though this work has a wide application, further studies of growth of varying plant populations in differing environments are necessary before we know why the crop responds in this manner. Without an understanding of the way in which simple ecological changes affect plant growth and yield, we cannot hope to determine the mode of action of the complex environmental factors that influence yield, even less the interactions between these factors.

Most of the work on plant and crop growth has been carried out in the temperate regions and it is in the tropics and sub-tropics where there is now an urgent need for basic research of this nature. In many colonies and former colonies, past emphasis on the export crops, such as sugarcane, cocoa, coffee and tea has led to the present inability of these countries to satisfy the nutritional needs of their growing populations with locally grown food. The population of Trinidad and Tobago is over 800,000 and the country imports food to the value of \$90,000,000 annually (1963-64 figures).

Research workers in this country have devoted much time and energy

to the study of the sugarcane, cocoa, banana and citrus crops, whereas it is only recently that breeding and basic research programmes have been carried out with the important food crops. At the University of the West Indies Field Station in Trinidad, investigations have begun on plant and crop growth under varying conditions in a number of food crops (Acland 1963, Akinpelu 1963, Cowling 1964, Eyi 1962). Much of this work was devoted to root crops and there is still a lack of information about the cereal crops, rice and maize.

Between October 1963 and December 1964 studies were made on the effects of plant population and nitrogen fertilizer level on the growth and yield of the rice and maize crops. It was hoped that these investigations would give some indication of the effects of interplant competition - on plant and crop growth, on plant yield components and on final yield per unit area.