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Grass.....

"Grass is the forgiveness of nature - her constant benediction. Fields trampled with battle, saturated with blood, torn with the ruts of cannon, grow green again with grass, and carnage is forgotten. Streets abandoned by traffic become grass grown like rural lanes and are obliterated; forests decay, harvests perish, flowers vanish, but grass is immortal. Beleaguered by the sullen hosts of winter, it withdraws into the impregnable fortress of its subterranean vitality and emerges upon solicitation of spring. Sown by the winds, by wandering birds, propagated by the subtle horticulture of the elements, which are its ministers and servants, it softens the rude outline of the world. It invades the solitude of deserts, climbs the inaccessible slopes and forbidding pinnacles of mountains, modifies climates and determines the history, character and destiny of nations."

John J. Ingalls.

A STUDY OF
THE REACTION OF SEVERAL VARIABLES
OF TOP GROWTH OF A PERENNIAL RYEGRASS/WHITE CLOVER
PASTURE, TO DIFFERENT DEFOLIATION
TREATMENTS; AND MEASUREMENTS ON
SOIL MOISTURE STATUS.

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by

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CHAPTER I

Introduction.

The agricultural research worker must on occasion adopt a broad view of farming purely as the management of plants and animals to produce human food. He has the task of outlining many of the principles to be used in farming practice, to increase world food production, in order to meet the challenge of a growing world population. He needs to consider the biological efficiency of the living processes and systems involved in food production; in much the same way as a businessman or farmer must consider the business efficiency of his factory or farm operations.

Food production may be increased either by bringing more land under cultivation or by intensifying agriculture on the existing areas of cultivation, thereby increasing production per acre. Watson (1958) described the problem as fundamentally one of increasing the total annual photosynthesis per unit area of crop, for it is the net product of photosynthesis which the farmer harvests. Photosynthesis requires light, moisture and nutrients, and as light is the only one of these factors which can not be readily supplied artificially, Donald and Black (1958) have suggested that the ultimate measure of agricultural efficiency could well be expressed in terms of the proportion of light energy utilised by the crops or pastures. The size and activity of the photosynthetic system then becomes one of the determinants of crop yield. The potential rate of photosynthetic activity is

controlled by the genetic make-up of the plant. The same is true to a certain degree of the size of the photosynthetic system, but the farmer too, through various cultural and management methods, exerts considerable control over the size of the system.

Particularly is this the case in grassland farming when periodic harvesting of the herbage whether by machine or the grazing animal is responsible for sudden changes in the size of the photosynthetic system - the pasture canopy. Knowledge of the optimum canopy for maximum pasture growth on different types of pastures is necessary. Also information regarding potential yield losses suffered under various frequencies and intensities of defoliation, and on the influence of the type and method of grazing on plant growth form is needed.

Past studies on the influence of various frequencies and intensities of defoliation on the yield of pastures have generally shown that lengthened spells between grazings result in increased yield. (Stapleton 1924; Richardson ^d et al. 1932; Hudson et al. 1933; Sears 1949; Wagner 1952).

These studies have largely measured seasonal or annual herbage yields and botanical changes.

On the other hand controlled environment studies on individual plants, together with other single plant studies, have presented information on plant behaviour and growth.

Within recent years investigations to bridge the gap between field trials on the one hand, and controlled environment and individual plant studies, on the other, have been

undertaken by several workers. (Brougham 1955, Black 1958). Plant growth has been studied in swards where competition for the individual factors which determine growth is present. The presence of competition between plants for water and nutrients, is probably of lesser significance than it is for light, for information on plant requirements can be obtained from individual plant studies. These studies of Brougham and Black have helped to explain the effects of different frequencies and intensities of grazing on pasture yields as well as to aid the application of results from individual plant studies to field conditions.

The work undertaken for this thesis has been an investigation into the reaction of pasture yield and composition, as well as pasture canopy and tiller population to two different grazing treatments. Measurements have also been taken during part of the experimental period on soil moisture status at predetermined depths under the two treatments. The experiment was carried out under conditions similar to those prevailing on a normal establishing perennial ryegrass/white clover sheep pasture. The investigation tends to be broad in nature rather than tackling a specific problem and consequently many further questions have been posed.