I. INTRODUCTION

The primary purpose of liming and fertilizing forage crops is to correct nutrient deficiencies in the soil and to increase plant yields. A secondary objective under grazing management may be the manipulation of the botanical composition of a sward so that a desirable balance of plant species is maintained. This generally implies a management program designed to encourage the legume component of a pasture, although from the standpoint of animal production the reasons for the superiority of legume-grass pastures may be imperfectly understood.

The application of lime and NPK fertilizer to a soil may, however, induce a variety of chemical and physiological changes in forage plants that can significantly affect the health and nutritional status of ruminant animals consuming the forage. Such changes may be beneficial or detrimental, depending on the nutrient status of the soil, and they may also be extremely difficult to define. This may be particularly true for effects due to changes in the micronutrient concentration of forage plants. As pointed out by Underwood (1970), any intensification of animal production through increasing crop yields may be accompanied by an increase in marginal mineral deficiencies which may be expressed merely as a "vague unthriftiness or suboptimal productivity" in the animal. Pope (1971), for example, has attributed S deficiency in alfalfa and corn crops in Wisconsin to the increased use of high-analysis P fertilizers rather than single superphosphate, and to the high rate of removal of S from the soil. He suggested that the lower level of plant S may be inadequate to meet the nutritional requirements of sheep.

It is necessary, therefore, to consider first what criteria may be used to evaluate the effects of fertilization practice on the nutritional quality of forage crops. Figure 1 illustrates the complexity of the problem and summarizes some of the major factors influencing the transfer of mineral nutrients from soil through the forage plant to the ruminant animal. The forage...