Although the genetic constitution of any plant species determines its chemical composition in general, this composition, which expresses a certain inherent quality, may be modified by nutrition or by variations in the environmental factors of climate and soil type. Quality as applied to crops is an exceedingly broad term. It may have reference to a variety of properties, such as, keeping quality or shipping quality of fruits and vegetables, or feeding quality of forages and grains, to mention only a few. With the advance in analytical chemistry, increased effort has been made to express differences in quality of crops by noted differences in chemical composition, and many important advances have been made by this means. The paper of Hartwell (90), a comprehensive review up to 1931 of the literature on the influence of fertilizer on crop quality, and also the review by Kraybill (111), summarizing the literature up to 1931 on the effect of plant nutrition on the composition of wheat, portray some of these advances.

The object of this study was to review publications, issued mainly during the past decade, limiting the subject to the effect of soil type and fertilizers on the chemical composition of certain crops used extensively for livestock feeding. These crops include some of the major forages comprised of pasture grass, grass hay, alfalfa, sweetclover, clover, and soybeans, and some of the chief grains consisting of wheat, oats, barley, and corn. With few exceptions only English, French, and German publications have been considered, and no claim is made in spite of these limitations the chief purpose of this study, namely to acquaint the reader with the general scope of the work, and with a general analysis of the experimental results, has been achieved.

Numerous factors often operating simultaneously are responsible for changes occurring in the chemical composition of crops, and, therefore, it is extremely difficult correctly to evaluate the part played by any one factor. In certain cases, the application of one nutrient element and the withholding of the others usually supplied by complete fertilizers may create severe unbalanced plant nutrient conditions in the soil, and, consequently, in the chemical composition of the crop grown on the soil. In other cases, where one or more nutrients are supplied by means of fertilizers, the result may be increased uptake of several other essential nutrients. For convenience the discussion of changes in chemical composition of the crops enumerated above will be limited principally to changes in content of nitrogen, phosphate, potassium, calcium, and sulfur; first, as affected by soil type; and, second, as affected by applications of nitrogen, phosphate, potash, and complete fertilizers in the order named.

Effect of Soil Properties on Composition of Crops

The knowledge that certain soils are capable of producing forages of better feeding quality than other soils under identical climatic conditions was used to advantage by livestock producers long before much had been learned regarding the chemical composition of crops or the nutritive elements responsible for superior feeding quality of crops. Despite this generally accepted fact the literature on the subject is not plentiful. The widespread use of fertilizers to correct plant nutrient deficiencies in the soil and the difficulties encountered in properly evaluating the influence of soil properties on crop composition, unless the determinations are made on crops grown on different soil types under similar climatic and meteorological conditions, account in part for the relative scarcity of studies on this subject.