

THE MITSCHERLICH METHOD. (Ref. 1. and Ref. 2.).

Until recently, the only methods in use for the estimation of the manurial requirements of soils, apart from field experiments, have depended on chemical analysis of the soil. All work of this nature is subject to considerable uncertainty since the chemical factors determining the availability of the soil nutrients have not been completely elucidated. Further, the determination of available nutrients in the soil is of little value unless the relationship between the content of nutrient and growth of the plant is known. The estimation of manurial requirement is inseparably related to the investigation of the Growth and Yield Laws; and the only proposed method which is based theoretically on these laws is that of Mitscherlich. However, it is not essential in practice to base a method on exact Yield Laws, so long as it is remembered that any method not so based will be of an empirical nature. Laboratory methods can be used for deducing the manurial requirements of particular crops, provided sufficient practical data are available to correlate the yield of crop or plant under different conditions with the estimate of manurial content.

Previous to Mitscherlich's work, most of the attempts made to explain the effect of a manure on the growth of a plant were based on what is known as the "law of the minimum". Mitscherlich's Method is based on his claim to have established a growth law which is applicable to all plant species. His "Law of the Physiological Relationships" states that the plant yield can be increased by each single growth-factor even when it is not present in minimum, so long as it

is not present in optimum, i.e. that each manurial constituent or growth-factor affects the growth of the plant independently. He has also been able to shew, in his Law of Diminishing Returns, that the rate of increase in yields is not proportional to the increase in the growth-factor or manure applied, but decreases in geometric progression with increasing additions, until a point is reached where no further increase in yield can be obtained. He has shewn that this maximum yield is obtained always from the same quantity of manure, no matter how the other constituents are varied, i.e. that the maximum yield obtained by increasing one constituent is always obtained from the same quantity of this manure.

If the yield of dry matter obtained is compared with the value of the maximum yield as defined above, the ratio of these two quantities, which is a measure of the "effect" of the given quantity of manure, is found to be constant, although the actual value of the increase in yield will vary under different conditions of experiment. He claims that the effect-factor is a natural constant for all agricultural crops and for each and every growth factor, i.e. "any physical, chemical, or, if one likes, any biological factor which can exert an influence on the plant yield." This is the most important point in the application of his laws to soil examination, and by far the greater portion of the critical work on this method has concerned the constancy of the effect-factors under different growth conditions, assuming the logarithmic nature of the yield law. It implies that the manurial requirement in a particular soil is the same for all crops.