# VAGARIES OF SOME ILLINOIS SOILS

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How often it happens that farm practice is based on what is popularly called "snap judgment." The trial of a new fertilizer treatment gives a certain result—if favorable, the practice is adopted without more ado, but if the result happens to be unfavorable, the thing is condemned and the matter is settled, presumably.

Experimental fields often return results of a single season that are by no means normal or reliable. To illustrate such a case we might turn to the record of the famous Morrow Plots located on the University campus. On one of the plots last year the yield of corn was 62 bushels an acre. Two years before, the yield of this same plot was 16 bushels an acre. Careful tests frequently reveal just such discrepancies in annual yields. A fair test of this kind ought to run over a period of three to five years before very much confidence can be placed in the result. Similarly, the trial of a new variety of seed cannot show its reliability on a single year's test because of the numerous circumstances that can turn the result one way or another. Weather conditions seldom remain constant from one year to another and, therefore, a specific variety cannot be expected to react identically in different seasons.

Fortunate are we who are charged with investigational work, when we have a field with a long-continued record to refer to—one in which the vicissitudes of a single season will not necessarily upset the whole history of the field.

Illinois has a number of long-time soil experiment fields located at different points in the state. There are more than two dozen such fields that have a record of 24 years or more. The oldest one of these fields is located on the campus of the University and is known as the Morrow Plots. These plots were established 63 years ago. Here we have represented three different systems of cropping, a three-year rotation of corn, oats, and clover; a two-year rotation of corn and oats, and a plot that remains continuously in corn year after year.

Naturally, great differences have resulted in the productiveness of these plots. For example, two years ago when all the plots were planted to corn, the yield on the continuous corn plot, without treatment, was 43 bushels an acre, while on the plot under the three-year rotation the yield was 67 bushels. The outstanding truth demonstrated on these plots is that crop rotation, beneficial as it is, will not of itself permanently maintain the fertility of the soil, in spite of a rather widespread belief to the contrary. This important fact is of such a nature that it can be demonstrated only by long years of careful observation. No single year's test could have told us this fact with any reliability.

Let us turn briefly to some of the other long-continued soil experiment fields. For the most part these fields are laid out to represent the livestock system of farming as well as the grain system. In the former system organic matter is maintained in the soil by the use of animal manure, while in the grain system the plowing under of legume crops along with stalks or other crop residues takes the place of the manure.

There is a very great range in the natural productiveness of these 25 fields. In a recent summary of the results from the untreated soil or the check plots, the most productive of these fields yielded over six times as much per acre as the least productive field.

It was found further that, with a single exception, every field responded with some gain in yield by one or more of the various treatments applied. In general, the largest gains were made on the soils that were naturally lowest producing. It happened that on the field showing the highest natural productiveness there was no gain whatever in yield by any treatment tried.

The greatest gains in yields from the seven fertilizer systems compared were made on the fields of low natural productiveness. On several of these fields of poor soil the yield was increased to three-fold by the use of the most effective fertilizer applied.

It is of interest to observe what kind of fertilizer gave the highest yield. As already mentioned, only in one case of the 25 fields no fertilizer gave an increase. Manure, used alone, gave the highest yield on two of the fields. In seven cases the effective combination was residues and limestone, while on nine other fields it was manure and limestone. On three fields the best results were secured by the use of the combination of residues, limestone and phosphorus and on three fields the winning combination was residues, limestone, phosphorus and potassium.

Thus we find that no single combination of plant food will serve best on all soils, but what is of equal importance that these fields have taught us, is that a similar study a few years later will show that their fertility requirements in many cases will have changed; at least, in the past, a change in their requirements has been shown from time to time. In other words, soil conditions do not remain stationary.

Herein lies the benefit of the long-time experiment field. The majority of these fields showed from the beginning a benefit from the application of limestone. A few fields, however, showed no distinct advantage for several years in adding limestone, but after a time under the cropping system, a need for lime gradually developed. This same principle has been illustrated in the use of other fertility elements such as phosphorus and potassium.

These experiences bring home the fact that the farmer's soil problem is never settled once and for all, but for the highest success constant watchfulness and study must ever be maintained.