Streamlining Soil Survey Information for Practical Use

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Modern soil surveys amass a wealth of detailed information. The survey maps show soil areas and their relations to roads, houses, schools, urban areas, power lines, drainage ditches and other features. The reports with these modern surveys are necessarily detailed and rather lengthy. They are made to meet the needs of an audience with widely different interests and problems.

Since the maps show soil differences in great detail, they may well be confusing to the average user. Indeed, this may be the reason that many potential users do not realize the fullest value of the modern survey information. Soil scientists are very much aware of this difficulty and are making strong attempts to "streamline" the materials for more ready use. In this effort they are constantly faced with the need for fuller interpretation of soil uses and alternatives.

Research Studies Back Soils Interpretations:

Today's soil scientists lean heavily upon experimental data to support the soil management section of the survey report. Without a sound management section the entire report is in jeopardy. Surely it will not be used fully unless suggested land use and management practices are sound and reasonably up to date.

Soil scientists appreciate the foresight of our predecessors who, as early as 1899, organized the Soil Survey and made its functions completely cooperative with the Agricultural Experiment Station of each state in which it operated. One of the compelling reasons for beginning the field study of soils was to learn where early experiment field research could be applied with success. All through the years data collected at such permanent field stations and at short term field trial locations have furnished much of the basis for our increasing use of technology in raising crops and has given substance to management sections of soil survey reports.

Indiana has made long time studies at the Agronomy Farm, Muck Crop Experimental Field, Sand Farm, Southern Indiana Forage Farm, and the former Crops and Soils Farm and Jennings County Field. Short time studies have been conducted at many outlying locations in the state and at certain other Purdue University farms. The soil survey has contributed to a fuller understanding of the soils and their management problems in Indiana. The permanent Stations have been selected on representative and widespread soils to help answer general and specific problems as they arose and to do basic research in anticipation of future problems.

Obviously, only a portion of some 300 soil series in Indiana has been represented on our Stations or tested at outlying spots and we cannot expect a much better sampling in the foreseeable future. It is necessary then to interpret as widely as possible from the soils tested to other soils not tested. Untested soils closely like those of the Stations as to chemical and physical makeup should respond about the same to tillage, fertility, and other management practices. Also they should have nearly the same water holding capacity and respond similarly to drainage. Thus, it is logical to group such soils and classify their management problems and solutions together. This way, we can more clearly understand soil relationships and we can make limited data on our many soils spread farther with greater surety. Perhaps even more importantly, we can compress the great number of individual soils to a relatively few groups which have common management problems. Also we can much more easily remember the main characteristics of a few groups of soils and the facets of their management.

Soil Groupings for Indiana:

An important part of the Agronomy Handbook prepared by the Agronomy Department and Soil Conservation Service people[1] is the arrangement of Indiana soils into seventeen broad groups based on similarities in characteristics affecting their use and management. Some are further subdivided due to special problems. Thus, the 300 soil series recognized in Indiana are included in 35 management groups to each of which a basic rotation suitable for maintaining a high level of production is assigned.

Each management group is characterized by a well known important soil. Other soils grouped with it are enough like this that they behave similarly and react about the same to management. An example is the Vigo silt loam group.

> This is one of a group of acid soils, derived from thin silts over Illinoian glacial till, which require drainage and liming. The group is described as "formed from good material with adequate water holding capacity, so thoroughly leached that acidity is high and fertility levels are relatively low. There is usually a distinct pan which interferes with internal drainage, and since the subsoil is strongly acid to great depths, the land is unsuited for deep rooted legumes such as alfalfa. However, such land is very responsive to good management practices."

Included with the Vigo are the well known Clermont, Avonburg, and Dubois soils and 19 other less extensive soil series. The basic rotation is row crop, row crop, grain, and meadow crop, which should give adequate erosion protection and maintain tilth for this normally nearly level group of soils. More sloping situations would call for a less intensive rotation including more grass.

There are 18 usable rotations for Indiana soil conditions listed in the Agronomy Handbook. These allow farmers a wide choice to select their crop and livestock needs and to protect their soils.

The Agronomy Handbook, prepared in 1956, is already a widely accepted working tool for farm advisors in the state. Because it includes a wealth of agronomic data on both crops and soils, abbreviated and arranged for ready use, it is often referred to as the agronomic "Bible"

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[1] Available through Agricultural Extension Service, Purdue University.

by field people. It is a fine example of cooperative effort in "streamlining" soils and crops information for practical use.

Soil groupings for Scott County:

Let us see how a modern soil survey report has discussed the management of 31 soil series and 5 land types mapped in recent years in Scott County.[2] Based on variation in slopes and thickness of remaining topsoil, these 31 series have been subdivided into 155 actual mapping units. On the published maps with aerial photographic background, there will be many small areas which are different in soil type, percent of slope or degree of erosion. Many fields will contain two or more soil series which may differ among themselves as to best use and management.

Recognizing that there are many possible uses for Scott County lands, these many soils have been placed into suitability groups for different purposes. In later surveys, like this one, proper land use and soil management are discussed in accordance with the capability of land for safe and efficient long time production.

Groupings for Cropland and Pasture:

The soils of Scott County have been arranged into 18 groups according to their suitability for cropland, pasture, and forest. They are grouped according to their capability for long time production according to their particular hazards in management. Following is an example of one of these 18 management groups, including several important agricultural soils of the county.

Soils of Capability-Management Group VIIe-3.[3]

This is a group of gently sloping, imperfectly drained, strongly acid soils with restrictive subsoil layers or pans. Some have been thinned considerably by past erosion. For good yields of most crops, some form of drainage is needed.

Avonburg silt loam, 0-2% slopes
Avonburg silt loam, 2-6% slopes
Avonburg silt loam, 2-6% slopes, moderately eroded
Dubois silt loam, 0-2% slopes
Dubois silt loam, 2-6% slopes
Dubois silt loam, 2-6% slopes, moderately eroded
Johnsburg silt loam, (0-2% slopes)
Whitcomb silt loam, (0-2% slopes)

The main problems in handling these soils are set forth and the principal management needs are stressed. They are nearly level and gently sloping soils which are well suited for cropland and pasture and have high yielding capacity if well managed. While some areas have been thinned by past erosion, this has not necessitated a change in soil management.

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[2] A standard detailed soil survey recently submitted for publication by the U. S. Soil Conservation Service and Purdue Agricultural Experiment Station.

[3] Class II lands have limitations in use, the wl indicating that the main hazard is periodic wetness due to slow drainage. Another group of Class II lands are moderately wet bottomland soils designated as IIw[2].

Groupings for Forestry:

A second group of soils suited only to a permanent cover because of shallowness and erodibility are given below to illustrate where forestry is the best practice.

Soils of Management Group 10. Capability Class VIIe.[4]

This is a group of strongl ysloping, shallow and moderately deep

This is a group of strongly sloping, shallow and moderately deep They are too steep and shallow for crop production and have only limited use for pasture.

Cincinnati silt loam, 25-35% slopes
Colyer soils, 12-25% slopes
Colyer soils, 25-60% slopes
Finley silt loam, 25-35% slopes
Grayford silt loam, 25-35% slopes
Jennings-Colyer silt loam, 18-25% slopes
Kinderhook silty clay loam, 12-18% slopes
Kinderhook silty clay loam, 18-35% slopes
Muskingum silt loam, 25-35% slopes
Muskingum silt loam, 35-70% slopes
Trappist silt loam, 18-25% slopes

Here the reader is referred to the Forestry Section of the report for management of timber lands. In a table there, the Colyer and Kinderhook soils are shown to have the lowest potential production rate for timber in the county, while Muskingum is somewhat better. All the soils are rated at three stand density levels.

In a tree planting guide the soils of the county are grouped for tree planting purposes into five different groups, with the adapted tree species listed for protected cool sites and exposed hot sites.

Soil Characteristics Important in Engineering:

Still another table includes for each soil its important characteristics influencing use for conservation engineering. These include kind of rock below the soil and soil depth range, the texture of soil and subsoil and the estimated permeability and infiltration rates. Special drainage problems and solutions and suitability for irrigation and for the construction of ponds or terraces are stressed.

These examples of soil groupings and condensed tables of important features should illustrate some of the modern trends in handling soil data in Scott County.

Maps to be Published on Air Photo Background:

As indicated above, the maps will be published on an aerial photo background, the same as the original photographs used in field mapping. Studies indicate that people can locate themselves on such a map and find soil areas more readily than on the conventional colored maps. The first maps like these were published for a Virginia county and were well received. They are expected to fulfill the needs of Soil

[4] These have severe limitations for use even under a permanent cover because of hazard of runoff and erosion indicated by lower case e. Low water holding capacity is due to shallow soils. A second group of Class VII soils consists of deeper soils which are steep, severely eroded and gullied.

Conservation Service farm planners and engineers and other farm advisors without need for further field work. Provisions are being made to publish extra copies of the maps for distribution in farm plans or otherwise.

Block Diagrams to Tie Soils to Landscapes and Parent Materials:

Three dimensional block diagrams allow readers to see at a glance the relations of soil series to the characteristic pattern of slopes and to their normal kinds of parent material. Use of these has proven very helpful to users of maps and reports in getting quickly the soil relations explained in detail in the reports. It is said that a picture is worth a thousand words and possibly this may be true for such diagrams. Late Indiana reports have carried these diagrams and their use will be continued. This is our last example of "streamlining" the survey reports for practical use.

Are Present Detailed Separations Necessary?

Some may wonder why certain soil separations are made originally if they are lumped into a fairly small number of groups for management. We must remember though, that the soils are not grouped the same for all purposes. A grouping for tree planting differs from a grouping for potential forest site productiveness. An engineering group of soils for highway construction differs markedly from a grouping of soils for drainage or irrigation. In other words, we need the basic soil differences clearly defined and mapped. We make the groupings as we learn about the soils, how they relate and how they handle for different purposes. Surveys made to determine land areas suited for a special purpose have been made in the past but they are costly in the long run for we can use them for little else than the original objectives.

Neither can we understand all the important soil features we may later need to meet some future demands on our soils. A case in point may illustrate this. Eighteen years ago in the mapping of lake laid clay soils in the east central part of Newton County, considerable variation was allowed in the mapping of a soil called Julian silty clay loam. In it is a good bit of soil now recognized as Rensselaer silty clay loam. Intensification of use demanded improved drainage and experience shows that the Rensselaer responds well to tiling because of its stratified silty and sandy substratum. By contrast the Julian areas drain poorly because of tough tenacious silty clay subsoils and substrata. Because the two soils were not separated and cannot be detected easily from surface appearances, they must be remapped now as demands for drainage increases. If enough time had been spent in studying the soils to see that the situation existed, they could have been separated during the original survey.

A parallel situation exists in southern Indiana lake laid clay areas involving the Caborn and Uniontown soils which are superior for tiling but were not separated in original mapping from Montgomery and McGary.

While some separations made in present detailed surveys may have little immediate value, we should never feel that they are valueless. As greater demands are put on our soils for crop production, construction and many other possible uses, we will surely want to know more about the soils of our land.

No one is more keenly aware of the need for better and more complete information to interpret our soils than the field soil scientist. It is a job he cannot do alone. He needs solid help from all persons involved in agronomic and soil engineering research. With team work we can get a better, more accurate and useful survey map and report. Much has been done in the past to get as far as we are now. Surely, progress will be faster in the future as we build on the framework already laid and make all possible use of the mass of accumulating data which can apply to our soils and their uses.