In the first one hundred years of Iowa history, farmers learned that their soils were generally rich and productive. They also learned that the naturally high level of fertility of their soils could not be maintained without good, careful management.

2. The Soil That Grows the Crops

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IOWA SOILS ARE PRODUCTIVE. THAT FACT IS PROVED BY the value of farm produce—a higher value than that of any other state in the Union. It's proved by a corn crop that excels that of any other state or any foreign country. It's proved by the livestock to which the corn is fed—no other state produces as many hogs and chickens as does Iowa. And it's proved by scientific study of the soils themselves. In 1934 it was estimated that one-fourth of all Grade A land in the country was contained within the state's borders.

Except for the drainage of wet lands, Iowans have had little responsibility for the original productiveness of their land. The soils of Iowa are the result of geological processes, which laid down powdered rock that was the parent material for soils, and of natural processes—such as chemical action, moving water, plant life—which turned this parent material into a true soil with characteristic layers.

Glaciers descended into Iowa five times. As they advanced from the north the glaciers picked up loose soil and ground or crushed into powder the rocks encountered on the way. Some of this accumulation remained where it was dropped by melting ice. Water flowing from melting ice washed other debris considerable distances. Winds picked up finer material from the river valleys and laid it down across the land. When the ice age ended, the state was buried under a deep covering of finely-divided rock flour, rich in the minerals that plants need. Its surface was a smooth and gently rolling plain. This topography, which makes possible the use of power machinery, is one of the state's greatest farming assets.

The glaciers treated Iowa well. Glaciers often scour and scrape away soil leaving only a thin covering of soil over the rock. This happened to the north, but not in Iowa. Glaciers also often leave great areas of sand and gravel, but in Iowa usually sufficient clay and silt were mixed with the sand to make good soils. Unlike most other states,

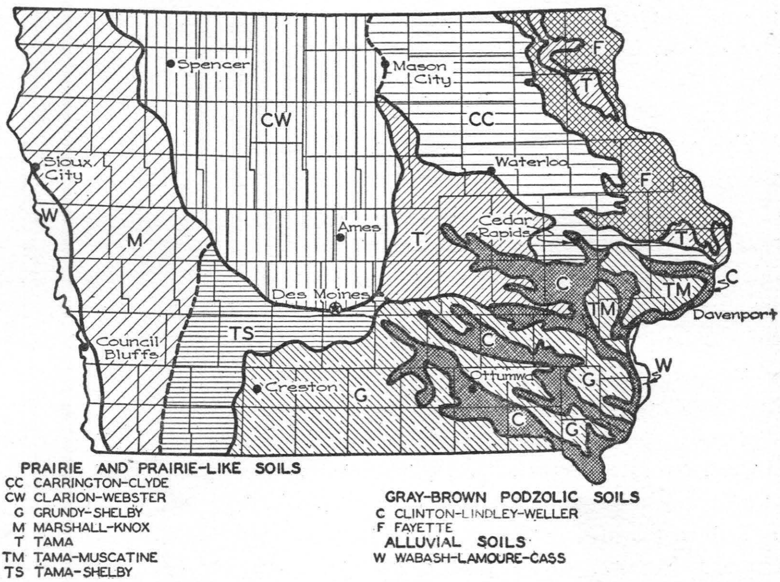

FIG. 2.—Iowa land may be divided into these principal soil associations.

Iowa was almost completely covered with deep deposits of finely-divided glacial and wind-blown material.

Next came conversion of this parent material into soil. As time passed, the action of plants increased the amount of organic matter in the surface layer. Clay and minerals moved downward and accumulated in the subsoil. Gradually the soil began to develop layers, called "horizons." These layers, taken together, constitute the soil profile—the nature of which determines the value of the soil.

In general, the best agricultural soils are those developed in climates just humid enough to grow luxuriant grass, but not humid enough to grow trees. Surface layers built up under trees are not as deep or as rich as under grasslands. Well-drained timbered soils are usually more leached than well-drained grass soils and their subsoils are heavier and tighter. Here again Iowa was fortunate.

The Cornbelt states lie in the transition zone between heavily timbered country and semi-arid grass lands. Their prairie soils, developed under grass, are among the most productive soils in the world. Until he reached Ohio, the pioneer farmer's first job was usually to cut down enough trees to give him land to plow. He first met rich prairie soils in Ohio and Indiana. Not until he reached Illinois did he find more land in grass than in trees. The farther west he went, he found less rain and trees, and more grass. In Iowa, only 15 per cent of the soil area was under timber.

CHARACTERISTICS

The prairie soils have many fortunate characteristics. Their surface layer is deep, rich in organic matter and nitrogen. Minerals needed for plant growth, such as calcium, phosphorus, and potassium, are present in greater quantity than is true in soils of more humid climates. Prairie soils absorb and store water readily and they are easily tilled. The prairie soil profile is familiar to Iowans as they have seen it in road cuts and newly-dug post holes: a dark brown surface layer blending into a yellowish brown subsoil which at depths of twenty to forty inches blends into a still lighter parent material.

In addition to this rich soil, Iowa has a favorable climate. Iowa is in a fortunate position north and south, just as it is east and west. It is far enough north to have long days during the growing season, but not so far north that crop production is seriously limited by a short growing season. Iowa is far enough north that the ground freezes deeply in winter, locking up the soil's fertility and checking the excessive weathering and leaching which tends to impoverish soils in states where winters are warm and wet.

The first settlers in Iowa had little idea of the richness of the land. Indeed, most of Iowa's first farms were carved out of the forests! The pioneers lacked experience with grassland soils and lacked the knowledge of soil types and crop adaptation available today. They had to learn the best ways of using the new land largely by trial and error.

In eastern Iowa, trees were found on the uplands as well as along the streams. As the pioneer moved west across the state he found few trees. Even the timber along the streams was thin and meager along the western boundary of the state. Those pioneers who came a little later, settling on the prairie, found that once the sod had been broken they had more fertile soil than the farmers who had gotten to the state first and settled on timber land.

CROPPING PATTERN

The pioneer, unacquainted with prairie soils, had little idea as to what crops would grow best on them. In the early years, even if he had known the cropping patterns suited to Iowa soil and climate, he didn't have much choice. There was little transportation available to bring in food and clothing. Trips to the nearest trading post were made on horseback or by wagon. As a result, the crops a farmer planted were those his family needed for food, and as feed for the few animals he raised. Horses and cattle were kept primarily to serve as draft animals. A few pigs and chickens were kept for meat, while sheep furnished wool to be woven into clothing. This type of subsistence farming was reflected in early crop patterns, in which garden crops like beans and pumpkins and orchard crops like apples and grapes had an important place. Certain other minor crops like tobacco and fiber flax were planted, not because they were suited to the soil and climate, but because the settler needed them. Wheat was an important crop, seldom taken to market, but instead hauled to the local mill to be ground into flour. If the farmer had more wheat than his family needed, the miller took a portion to pay for the cost of grinding. Corn furnished feed for livestock and food for humans. Only a small excess over the family's needs was grown to be sold or traded for sugar, coffee, tea, and thread. Since the farmer raised little to sell and most of his labor had to be done by hand, acreages were not large. Much of the land was left in grass and consequently the problem of soil management was of little importance.

Population increased, however, and pressure for land became greater. The coming of the railroads, the growth of county seat towns approximately twenty-four miles apart, and the improving of country roads helped bring in commercial farming. Now the farmer began to choose those combinations of crops and livestock which would give him the highest net income.

Although Iowans knew little about soil, they soon found that their soils had a lot to do with the combination of crops which was most profitable. By trial and error, the Iowa farmer discovered that his land was best suited to the growing of corn. Wheat, which had played such an important role in the pioneer economy, became less important.

Though corn is the major crop on Iowa farms today, it is by no means the state's only important crop. Not every acre is suited to corn, and even acres that are cannot be planted to corn year in and year out. Crop rotation is necessary to preserve soil fertility.

Livestock production is a major enterprise in all parts of the state, but the percentage of crops and pasture land, and the kinds of livestock raised differ from one part of the state to another. These variations arise from basic differences in soils. In the better soil areas of the state, percentage of crop acreage is highest, and hay and pasture the lowest. For example, the Cash Grain Area is a section of rich soils, with little waste land. It coincides closely with the region covered by the mose recent glacial invasion of the state—the so-called "Wisconsin Drift Area." Furthermore, this area was nearly all formed under prairie grass rather than under forest.

DRAINAGE

All land which was better drained because of its topography was first cultivated, while the heavier, darker, more fertile lands remained unbroken. Large areas of wet land were also left unplowed in this section of the state in the early days. In most of the eastern two-thirds of the state there were large undrained flat lands. In Henry County, for instance, all the land in timber was under the plow by 1850, while the flat prairie areas in Canaan Township were not broken out until about 1900. This township today is one of the most productive in the county.

Tile drainage made possible the reclamation of thousands of acres of some of the most fertile land in the state. Poorly drained lands which had been purchased at a low price with a moderate investment in drainage could be sold at a good profit.

Tile drainage, however, came slowly. Many legal points had to be clarified first; enabling and other legislative acts were necessary. Drainage districts had to be legalized with power to tax. Laws with respect to the rights of the individual had to be passed and then clarified by the courts.

Legal obstacles, however, were not the only barriers to quick land drainage. How best to drain small areas of land, as well as large tracts, had not yet been found. Large ditches could be dug to drain lake beds, large sloughs, and other sizable wet areas. These cost a good deal and required drainage taxes to be levied on the land.

To drain all of the land adequately, to take the water from each small slough, pot hole, and duck pond, however, would have required elaborate ditch systems and would have created difficulty in farming operations. Some system of subsurface drainage was obviously necessary.

Methods used in Europe were tried first. Mole drainage, where an opening is forced through the soil similar to that formed by the common garden mole, was attempted, but did not work out satisfactorily on many soils. Early drainage systems sometimes consisted of flat tile or brick laid in the bottom of the trench to form a rectangular or triangular-shaped drain. Later, round tile drains were tried and found suitable for tile. Tile factories were built and soon were able to supply the local demands.

Tile drainage of wet lands began about 1890 and reached its peak before 1910. A high proportion of the wet lands had been tiled by 1915. Unfortunately, many of the early systems were not adequate. Too often the tile were too small for the runoff which they had to carry. Many drainage patterns were not scientifically designed and many systems have not been maintained in proper order. As a result many fields once tiled are in need of drainage improvement. In general, though, the results were good and thousands of acres of fertile land were brought into cultivation. By the time of World War I, Iowa farmers had spent on tiling an amount equal to the cost of the Panama Canal.

TABLE 5
TYPE OF FARMING AREAS—PERCENTAGE
(1940 Census Data)

Land Use	State Total	North-east Dairy	Cash Grain	Western Livestock	Southern Pasture	Eastern Livestock
Permanent pasture	13	16	7	8	21	15
Corn	35	33	42	40	26	34
Small grains	20	21	27	23	12	16
Hay and rotation pasture	32	30	24	29	41	35

We can see the slope and fertility of soil reflected in the crops men grow. (Table 5). Southern Iowa, for example, has only about half as much land in intertilled crops, but nearly three times as much land in pasture as has the Cash Grain Area. Hilly, humid Eastern Iowa most closely resembled Southern Iowa, while Western Iowa, hilly but less humid and more recently settled, closely resembles the Cash Grain Area in this respect. What is true for the state is true for the individual farm—poorer land remains in woodlot or pasture.

Outside the Cash Grain Area, topography has developed on older glacial or wind-deposited materials. Here streams have had time to develop, erosion has taken place, and there is a higher proportion of steep land best suited to permanent pasture. This is especially true in northeastern and southern Iowa. In northeastern Iowa, pastures permit the raising of dairy cattle. In the warmer southern counties, dairying gives way to beef cattle.

COMPOSITION

Soils in these southern counties are older than those in the rest of Iowa, for recent glaciers melted before they got so far south and did not bring in new soil material. Because they are older there has been more time for lime to leach out, leaving them more acid. Lands along the streams that developed under timber usually lack the deep surface soils common to the prairie. In the older soil areas some of the flat lands between streams, where soils have developed under grass, have been leached. Clays from the surface soils have moved downward into the subsoils to such a degree that drainage is often impeded. Under good management, however, these soils can be improved.

The farmer originally had little responsibility for the richness of Iowa soil. Indeed, often without his knowledge, the soils determined what crops he should raise. However, the farmer has had an influence on the land—all too often to the detriment of the soil and his own welfare. The very act of farming meant a loss in soil fertility. There were two reasons for this. One is that by breaking the thick, protective layer of prairie sod, the farmer opened the soil to the destructive influence of the wind and water. The other reason is that the plants man grew took elements out of the soil—elements that had been laid down by the glaciers, or carried in on wind of the glacial age thousands of years before.

This is true of any plant, of course, even the prairie grass itself. But prairie grass died where it grew and the elements stayed with the soil. When man grew plants he ate them or fed them to his animals. Whether the elements ever got back to the soil again depended, as we shall see, on a great number of things. Not all crops take the same quantity of elements out of the soil. Moreover, when corn is fed to livestock on the farm and the manure returned to the fields, the soil loses less than when the corn is shipped off and made into breakfast food. Iowa soils benefit greatly by the fact that Iowa farmers feed their corn to hogs and cattle.

NITROGEN

Suppose we see how this works by taking a little closer look at one element, nitrogen—one of the most important elements in the soil. As we do so, keep in mind that in 1846 no farmers anywhere knew the facts we know about soils today. The past one hundred years of the history of soils in Iowa is largely the story of how farmers learned facts like these about nitrogen and put them to work.

The amount of nitrogen that will remain in the soil depends on another element—carbon. In most soils, it takes about twelve pounds of carbon to hold one pound of nitrogen. If the carbon goes, the nitrogen goes too. How is carbon kept in soil? Plants take carbon out of the air. The more plants or organic matter in the soil, the more carbon; the more carbon, the more nitrogen. So if a farmer wants to increase carbon in the soil, he can do so by plowing under green plants, by spreading manure which is full of plant residues, or by plowing under the unused residues of crops. At Ames it has been found that when land is planted to corn continuously for twenty years, the amount of organic matter in the soil drops 19 per cent. If two tons of manure per acre are added each year, only 6 per cent of the organic material is lost.

Cattle entered Iowa in the 1830's, on the heels of the hunters and trappers. They grazed on the open range of the prairies and were driven to Illinois for fattening. In any one community, grazing lasted only about ten to fifteen years before crops and fences came. As soon as livestock were penned up, the problem arose of spreading the manure over the fields. As early as 1864, B. H. Wilder remarked in the State Agricultural Society's report that though it was convenient to move feeding yards about the farm, it was not economical. Manure will lose most of its value if handled carelessly, so Wilder recommended that it be stacked to prevent leaching. At that time, he declared, labor was too dear and produce too low to permit storing manure in sheds, tanks, or compost heaps. But spreading manure from a farm wagon by pitchfork is hard, dirty work and on Iowa's fertile soils seemed rather unnecessary. The soil produced well and there were fresh, new lands farther west. Even if the pioneer had known all he knows today he might not have acted much differently. For though introduction of mechanical, horse-drawn manure spreaders after 1900 made the job easier, manure still is carelessly handled on many Iowa farms today.

We have pointed out that plants contain carbon which is needed to hold nitrogen in the soil. But plants also hold nitrogen itself. There is nitrogen not only in the ear of corn but in the stalks and corn cobs as well. Growing corn at the rate of 100 bushels to the acre will require 160 pounds of nitrogen from the soil. Even if everything but the shelled corn goes back to the soil the soil is still poorer by 100 pounds of nitrogen. All this is not lost, however. If the shelled corn is fed to livestock, the animals retain only about twenty pounds—the rest goes into manure. Even if the farmer used the very best methods of handling manure it would still lose probably half of its nitrogen content. Under poor methods the manure will lose practically all its nitrogen. Summing up, a 100 bushel corn crop takes about 160 pounds of nitrogen out of the soil. Of this about 100 pounds may get back, leaving a net loss of about 60 pounds—

Returned in cornstalks, etc.	60	pounds
Returned as manure	40	pounds
	100	pounds returned
Retained by the animal	20	pounds
Lost in the manure	40	pounds
	60	pounds lost

A loss of 60 pounds is certainly a lot better than one of 160 pounds—but it's still enough to cause eventually a serious loss in soil fertility.

This does not mean that Iowa soil is doomed to lose its fertility. As every farmer knows, there are ways of building up nitrogen in the soil by pulling it out of the air. Every farmer has nitrogen-producing factories on his own farm, except that he calls them "legumes." Legumes take nitrogen from the air. Roots that may go twenty feet or more into the ground build up nitrogen that remains after the plant is gone. And of course if the legume is plowed under, the nitrogen in its stem and leaves goes to the soil also.

The native wild grasses, which furnished satisfactory hay for horses, were not as rich as legumes in the proteins cattle need. Perhaps this, more than the unrealized effect on soil, may explain why farmers very early introduced such legumes as red clover. The pioneers knew clover was needed by livestock. Alfalfa is another legume grown primarily for hay. Alfalfa came rather late in Iowa's history, being limited in 1900 to only a few successful seedings. By 1910 total alfalfa acreage amounted to only 29,000 acres. By 1943 1.3 million acres were planted to alfalfa. The first legume to be adopted largely for its effect on the soil was sweet clover. It always has been grown primarily to be plowed under for green manure. Planted with small grain, it remains in the fall after the grain is harvested and is plowed under the next spring as the land is prepared for corn again. A few farmers in both eastern and western Iowa used sweet clover successfully before 1910, but it did not become important until about 1920. It is probable that something like two million acres of clover are planted with small grain each year. Figures are available only for second year plantings, clover grown by itself, for hay or pasture. Ordinarily 300,000 acres of such clover are found in the state.

To take nitrogen out of the air, certain bacteria must be present on the roots of legumes. Without these bacteria the legumes themselves won't grow well, nor will they return nitrogen to the soil.

Farmers didn't know about bacteria, but they did know clover would grow in some fields and not in others. When one early Iowan imported clover seed early in the state's history, he told friends in Illinois to send him two bags of soil from their clover field. He spread the soil on his fields, planted clover which flourished due to the bacteria in the soil from Illinois. This was a rather inefficient method, however, and successful growing of legumes waited until early in this century, when farmers began inoculating their seed by mixing it with bacteria cultures.

CALCIUM

Even if bacteria are present on legume roots, legumes won't flourish unless the soil has a certain amount of calcium. Lime, the common name for calcium, is lost by dissolving in water and leaching away, and by being taken away in crops. Consequently, the longer that land is farmed, the less and less calcium it has. As the amount of calcium decreases the soil becomes "acid." Some legumes, such as red clover, will grow fairly well on acid soils, but they are not very efficient in taking nitrogen from the air on such soils. Alfalfa and sweet clover almost always fail if the soil is very acid. Where soils are acid, lime much be added in order to grow legumes efficiently and raise the general level of fertility.

Lime has been used by farmers for a long time. The Romans used it two thousand years ago. Later it was used in Europe. Farmers in New England found it necessary on their acid soils early in the Nineteenth Century. Partly because they grew the acid-tolerant clovers and because many of the soils were much better supplied with lime than they are now, after years of cropping and exposure to leaching, the early Iowa farmer did not realize the need for lime.

Indeed, it has taken a good deal of talking and writing by leading farmers and soil experts to explain to farmers why they need lime. About 1900, scientists began testing soils for acidity with litmus paper, a not too accurate method. About the same time it began to be recognized that failure of clovers and other legumes was a sign of lime deficiency. Iowa State College publications began urging the use of lime about 1904 and a bulletin in 1914 reported tests for acidity of samples of soil taken from different sections of the state. Extension workers and vocational agriculture teachers in the high schools began stressing the importance of liming. It has been estimated that Iowa's twenty-five million acres of crop and pasture land should receive six million tons of limestone a year for the ten years to 1956. In no year up to Iowa's centennial has the amount of limestone applied been sufficient.

The job of keeping nitrogen in the soil is a complex one—and sometimes the farmer starts too late. Where lime hasn't been used for many years, manure has been wasted, and surface soils have been permitted to wash away, organic matter, nitrogen, and other plant nutrients must be put back into the soil. Meanwhile the farmer must grow some small grain and corn. In such a case, commercial nitrogen fertilizer is probably the answer. Even with proper land use and good soil, small amounts of nitrogen fertilizer give crops a more vigorous start, especially in wet seasons. Moreover—and this is something we haven't mentioned before—nitrogen, although it is very important, is only one of fourteen elements plants need. Furthermore, nitrogen is the only one of the needed elements found in soil which can be added to the soil from the air. When any of the other thirteen are not present in usable form, they must be added. Next to nitrogen, elements most commonly lacking in sufficient amounts in the soil are phosphorus and potassium. Phosphorus concentrates in the kernel of corn and in the blood and bones of animals so that there is a steady drain of it from Iowa farms every year.

PHOSPHORUS AND POTASSIUM

Sending a thousand-pound steer to market, for example, will remove phosphorus equivalent to a 100-pound sack of superphosphate. Although low in phosphorus, Iowa soils are unusually high in potassium, which has not been used much as fertilizer except on sand, peat, and high lime soils. Lately, however, other soils have been found where potassium has increased yields, especially of corn. Even before World War I, Experiment Station work revealed the need of phosphate on many Iowa soils. Until recently farmers have been slow to apply phosphorus and potassium fertilizer to the land. All supplies of phosphorus and potassium had to be shipped into Iowa from other states, and there was no good quick method of telling which soils needed it. Some soils responded and some did not. In the last few years, however, chemical tests for estimating the fertilizer needs of soils have been developed and are being used more widely. Together with the information obtained from a large number of fertilizer experiments that have been carried on in the different soil areas of the state, they are a valuable guide to efficient fertilizer use. Today, Iowa farmers are using more than 150,000 tons of fertilizer annually.

It should be remembered that there are two principal ways in which soil loses fertility: Farm crops take elements out of the soil, and wind and water carry elements away.

TILLAGE

Before man came to Iowa, nature had reached a kind of balance. Trees and grass alike replaced as much organic material and nitrogen as rain and wind carried away. But once the land was cleared of trees and sod broken, erosion began to accelerate. Constant plowing and cultivating of the surface soil speeded the loss of organic matter. Once grass roots went deep into the earth to reach nutrients laid down by the glaciers and bring them up nearer the surface. Organic material accumulated and a good, granular structure built up so that the soil was porous and absorbed the rain. Tillage destroyed these qualities, breaking up the grains of earth into smaller particles which water could move about easily. Soils ran together more easily, becoming cloddy and more impervious to water.

The cast iron plow gave way to steel; two-bottom plows and the tractor made tillage even easier. For a time experts believed that water could be conserved by stirring up the soil frequently. Today experts believe land should be cultivated only often enough to keep down weeds. Although Iowa hills are not steep, half the land has an average slope of more than 5 per cent. On the Marshall soils of southwestern Iowa it has been found that even under rotation, land of 9 per cent slope can lose as much as ten tons of soil per acre in a single year. Iowa had an advantage over other states because most of its land was tillable. But it had two disadvantages that some farms in the East did not have. One was that so much of its land was in corn which had to be cultivated to keep down weeds, and frequent cultivation made it just that much easier for soil to wash away, wherever the land was sloping. Iowa also had an unusual amount of up and down hill plowing. In the East, farms were often laid out to follow the natural boundaries of the land. But in Iowa the land had been laid out in rectangular blocks, and when the farmer cut up his square farm into fields he naturally cut his fields out on a square pattern.

ROTATION

Even the best of land can't grow corn year after year without rest, however. Farmers in the old world had been rotating the land for years. Even back in the Dark Ages they used to let their fields "rest" periodically. Experiments in rotation had been tried in England before Iowa was settled, and farm journals strongly urged rotation in pioneer days. The first Iowa Experiment Station bulletin, published in 1888, declared: "We will try to determine . . . what gains should result from the proper rotation of crops." Actual tests (with open-pollinated corn) on the rich black soils of central Iowa showed that when land is planted in corn continuously, yields averaged 49.3 bushels. Planted alternately to corn and oats the land yielded 59 bushels of corn, and in rotation of corn, corn, oats and mixed hay, yields reached 70.3 bushels.

The reasons for rotations are clear. Hay crops checked erosion and cultivation waste. Plant residues, highest when pasture crops were plowed under, returned valuable elements to the soil. Legumes in rotation returned nitrogen to the soil. Of course, actual rotations differed from one area to another, just as we have seen that the crops themselves differed.

Iowa farmers began to take a greater interest in soil conservation early in the thirties. Since that time, many have learned how to cut down losses caused by cultivating land on gentler slopes not steep enough to be retired to permanent grasses or trees. They have learned to use such practices as terracing, contouring, and strip cropping. They have learned where and how to use dams and how to protect waterways with grass and other forms of vegetation. They know that certain parts of their lands because of their steepness can be held only by grass or trees.

But today's systems of crop and soil management developed rather slowly. In 1905 the first publication systematically describing the soils of Iowa was published. In this the basic principle that different soils require different methods of farming was expressed. This report was soon followed by the beginning of soil surveys of the state.

Gradual expansion in research programs by Iowa and other states and by federal agencies since early in the century has yielded basic information on soils which is helping us to understand their peculiarities and to plan how to use them to best advantage.

The findings of such studies are helping to take the guess out of farming. How much our present systems of soil management have been developed from individual experiences through the years and how much from planned experimentation is hard to tell. Certainly experience was the chief guide in the early days. In the future the results of purposeful effort to secure and organize knowledge of Iowa soils will play an increasingly important part in land planning and soil management.

During World War II, as had happened twenty-five years before in World War I, acreage in corn went up. And at the war's end, after forced production, farmers looked forward to sound land use. More steep land awaited return to timber or permanent pasture. Gullies needed fencing and planting, ponds and dams remained to be built, rolling fields called for more contoured cultivation and an end to "square farming on a round country." Old drainage systems needed renovation. Some areas were still in need of their first tile. Many acres needed lime, and organic matter, manure, and green manures. Some needed fertilizers.

Iowa's soils were no longer as rich, at the end of its first hundred years, as they had been at the beginning. But farmers were aware of the problem of soil depletion. Co-operative group action in the form of soil conservation districts, organizations of farmers for the purpose of combating erosion and building up and maintaining the fertility of their soils, was rapidly spreading. Research and educational programs were expanding to meet farmer demands. And knowledge was available, lacking in 1846, that would enable farmers to conserve their heritage. In greater and greater numbers they were doing just that.

This growing interest in the soil and its conservation has come none too soon, for rich lands can be ruined just as well as poor lands. Their's is even the greater danger because on better lands the processes of soil depletion are often not apparent until most of the damage has been done. With hard work and vigilance, but *only* with hard work and vigilance, can the fertility of Iowa soils be maintained and the state remain sure of her leadership in agricultural production.