Are We Starving to Death?

By NEIL M. CLARK

An eminent soil doctor warns that unless we attack the problem of mineral-depleted land on a national scale, we face slow extinction from "hidden hunger."

WHEN Jim was driving me to the station, he abandoned the old-college-days kidding attitude that he had maintained at dinner before his wife and daughter, and spoke seriously of his personal tragedy. He mentioned his father, who had lived to be eighty-six and was strong and active almost to the last. "My aunts and uncles, too," he said—"none of them died under seventy-five. And look at me," bitterly. "Just look at me!" I had already looked and been shocked. "It's my heart, the doctor says. Why should I have a bad heart? I've always taken care of myself. But here I am, a little past fifty, and I know as well as anybody that I might pop off at any time. Neil, can you tell me—can anybody tell me why I'm not so good a man as my dad was—why I'll never live as long as he did?"

I couldn't, and didn't try. It occurred to me, too, that I couldn't explain why Jim's wife has been anemic as long as I have known her, nor why their daughter, as a child, gave signs of rickets.

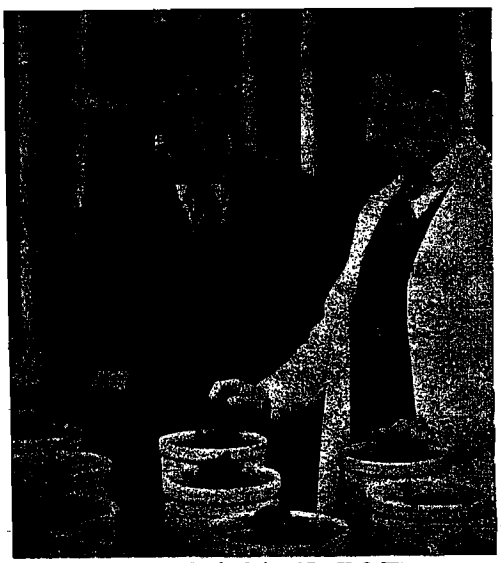
Two things in the next few weeks reminded me of Jim's desperate questions. While I was having an inlay replaced, my dentist took occasion to say that his own teeth weren't so good as his Texas father's, and that few of his patients had teeth as good as their parents'. I wondered if that might not have some bearing on Jim's questions. Still later I was sitting in Dr. Wm. A. Albrecht's office at the University of Missouri, in Columbia, listening to an absorbing and almost unbelievable story about health in America and the particular chapter in that story which he has helped to write, and I interrupted to mention Jim. "Could it be," I asked him, "that he is simply hungry?"

"It could be," Doctor Albrecht answered.

I had come to ask Albrecht if America could expect to keep on eating well. "America," he said grimly, "is not eating well now."

The story that Doctor Albrecht laid before me is what I propose to tell in this article. In my opinion, it is of the deepest possible significance to Jim and to millions more in America who—whether classified 4-F by their draft boards, or kept from work at war jobs for days at a time by colds and other "minor" complaints, or suffering from this or that occasional ache or misery that they can't explain, but that often prevents their feeling up to par—have wondered why they don't have the abundant health to go with "the abundant life" that they have heard so much easy talk about. The story isn't all about Albrecht; he is one of many looking beyond quantity into the quality of the food we eat. The Federal Government has established a focal point for such research at the Department of Agriculture's Plant, Soil and Nutrition Laboratory, organized at Ithaca, New York, five years ago. But Albrecht has played pioneer and leader, and has, perhaps, been intimately familiar with more phases of it than anybody else in the country. The substance of the story is that an enemy has come among us unawares. It stalks us invisibly, strikes silently, is almost as hard to believe in as germs were when Pasteur revolutionised medicine by revealing their role in disease. The new enemy is never dramatic. It appears as a disease of the soil directly transmissible to man, but unlike its devouring cousin, erosion, it silts up no rivers to cause billion-dollar floods, digs no gullies to swallow up farms. It works away, but leaves no clear-cut sign. Fields that always have been green may be green still. But the same life is no longer in them.

"We began getting our basic facts," Albrecht said, "about the turn of the century. Nutritional research got under way. Vitamins were discovered. People got curious about the chemical properties of food. Cookbooks recognised health as well as appetite. Doctors, through experiment and observation, began to understand that more diseases than they ever suspected could be traced to dietary deficiencies, and that many sick people were hungry people. They called it 'hidden hunger' because people who ate three squares a day, and never knew what it was to ask for food and not get it, often suffered from it. One of the hidden hungers was for calcium, a shortage of which could cause rickets. There were many others. Goiter was hooked up with a shortage of iodine; night blindness with a shortage of carotene; anemia with iron—and possibly copper—shortage; thyroid troubles with a shortage of zinc; tonsillitis with a deficiency of silver; tooth decay with shortages of calcium, phosphorus, fluorine; and so on.



Dr. Wm. A. Albrecht *(right)* and Dr. H. S. Wittwer checking results of some soil tests on spinach.

"These discoveries," Albrecht continued, "led inevitably to another. Some of us, sometime, were bound to make it, for questions and conjectures popped into any thinking man's head. What could cause hidden hunger? A train of thought suggested itself. We satisfy hunger by eating. If we eat 'enough' and still are hungry, mustn't something be lacking in the food? How does nourishment get into food? Well, it must come by way of the flesh, fish or animal products we eat, or by way of vegetables, fruits, nuts, berries. Where do these foods get it? The final answer is: By a process of manufacture, plant growth, which beats anything Ford has dreamed up. The end product of that biggest-of-all big business is a great variety of plants; its machine tools are soil, air, sunshine and water. You and I never could make a meal of sunshine and raw minerals, but plants can and do. Then we eat them or we eat animals grown by eating them. Plants are the earth's basic food factory and nourishment warehouse, and if something is missing from our food that we need for health, it must be missing or deficient in plants. Yes, but why is it missing?"

This train of thought took the affair out of the field usually thought of as medicine, and brought Albrecht and others like him in. Like Pasteur, who advanced medicine so much, Albrecht is not a doctor of medicine, though he has always been deeply interested and numbers many physiologists, physicians, surgeons and dentists among his close friends. He is a doctor of soil, a student and teacher of soil chemistry, head of the Department of Soils at the University of Missouri. However, he has never believed in hard-and-fast boundaries between sciences, and when it became clear there must be a tie-up between human health and the soil, he made that the major goal of his research. How, he asked himself, do soil and plants work together? Strangely, though agriculture is mankind's oldest industry, nobody knew; not as scientists insist on knowing. What, Albrecht asked himself, is plant health, and how does it depend on soil health, and what does it mean for those of us who can't explain or doctor our chills and fevers away?

Two things that Albrecht did have helped to revolutionise scientific thought and practice in this whole field. First, he developed a complete hypothesis as to why some soils in constant agricultural use become sick and others stay well; some of the soils of China have been in yearly use for forty centuries and are still healthy. Next, he developed a fully controlled technique for testing treatments designed to produce healthy soils and healthy plants. These two steps are somewhat comparable to the development in medicine of the germ hypothesis, plus a laboratory technique for finding out how germs act. To describe Albrecht's hypothesis and technique in detail would take more space than can be allowed in this article. But enough must be told for the reader to understand in a general way what happens. Perhaps the easiest approach is through Hans Jenny and his experiment that failed.

Jenny, fresh over from Zurich, was one of Albrecht's research assistants from 1927 to 1936; now he is associate professor of soil chemistry at the University of California. He was experimenting with soybeans fed different diets of calcium.

Albrecht proposed the method of the experiment, suggesting use of colloidal clay. Ordinary clay is found in most soils, but colloidal clay was something new; it was ordinary clay with every shred of plant food eliminated. It was hoped it might be useful in making pottery, bricks or other articles, but Albrecht conceived a use for it in studying the feeding habits of plants. He argued that he could add any plant food he wanted to, in any quantity, observe the effect on growing plants, and have an absolute check on cause and result.

So Jenny's experiment was planned. In certain pots he put colloidal clay with only a little lime; in other pots he increased the percentage of lime, making several test mixtures. He planted his soybeans, watched them sprout, and after several days came to Albrecht with a long face.

"I'll have to start over," he said; "so many of the beans are dying."

He did start over, using the same plan. But once more he came to Albrecht with a story of dying plants; some "disease," he said, was attacking them. He was ready to try again, but this time Albrecht went to the greenhouse with him and, after a look at the plants, suggested that Jenny take his notebook and jot down some figures. Albrecht counted the number of living plants in each pot, and Jenny wrote the numbers down. When these were compared, pot by pot, with the quantities of lime used, it was seen that almost all the plants died in the pots with least lime, but a gradually increasing number lived in the pots containing more lime. As far as the original purpose of Jenny's experiment went, it was a failure. But in another sense it was brilliantly successful, for it demonstrated that the colloidal-clay technique would serve Albrecht's ends.

He had the imagination to use the new technique to good purpose. In later experiments and through long hours of reflection about results, he developed his complete hypothesis as to what goes on in soils, how plants and soils work together, and how soils become sick and make plants, and then men and women, sick. A plant, he points out, obtains only a small part of its total growth from soil materials; the rest comes from air, water and sunshine. He likes to tell his students about the classic experiment of the seventeenth-century chemist, Van Helmont, who planted a five-pound willow in 200 pounds of earth, never added anything but water, and after five years found that the willow weighed 169 pounds and the earth still weighed 200 pounds, less about two ounces.

"What the soil contributes to growing plants," Albrecht says, "is very little in amount, compared with what air, water and sunshine provide; on the average, it amounts to about five parts in one hundred. But that little is absolutely essential to plant and human health. For soil materials are 'grow' foods—the minerals that make bones and teeth in animals, and keep us provided with a strong structure, without which we're like an automobile built of soft tin. Air, water and sunshine, on the other hand, make the 'go' foods—fuel and energy to keep the machine running. There's no indication we'll ever run short of the airborne elements in our foods. But right now we're running short of soil-borne elements. And that's our trouble. When we're short of minerals, we're short of basic health. Short of vitamins, too, for there's some unknown connection between minerals and vitamins. We know when minerals in a soil are abundant, vitamins usually are abundant in the plants that grow there."

The next fact to remember, Albrecht says, is that plants will make a lot of growth, just as you and I will, even when certain wanted minerals are missing. But the plants themselves will be different. Thus, cabbage is one thing if grown on one kind of soil, another if grown on another kind of soil. There are more minerals in it, or less, depending on the minerals in the soil, and apparently more or less proteins and vitamins in it. The same is true of carrots, beets, peas, oranges, apples, potatoes, sweet corn or any other plant product we use as food. The calcium concentration of a lettuce leaf can be varied twofold and spinach threefold, according to the calcium in the soil. Popeye would never jitterbug to the Coast on spinach grown in mineral-poor soil. Albrecht has played with many vegetables in research, varying mineral content up or down by varying soil nutrients.

The same mineral variations occur in grasses and other plants eaten by domestic animals, and what they eat, in turn, affects their products which we eat. Our beefsteaks, pork chops, lamb roasts and omelets can be mineral-shy, if the cows, hogs, lambs and chickens were shortchanged on their minerals.

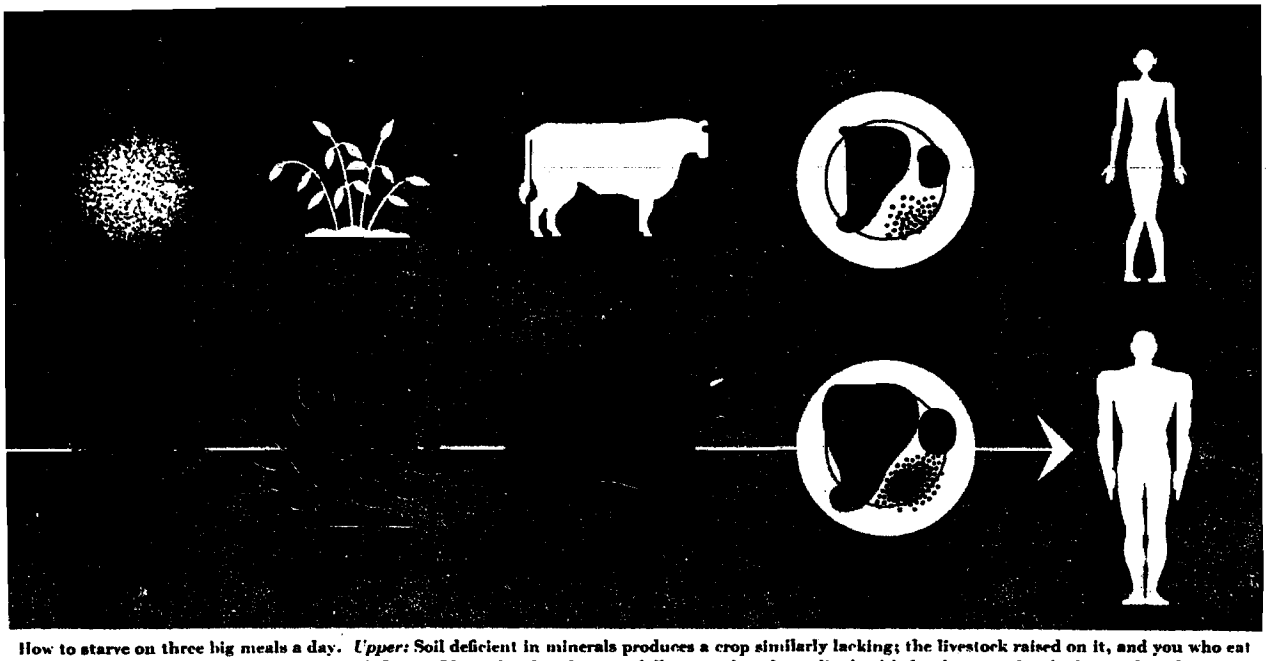
MISSOURI AGR. EXP. STATION PHOTOS

These soybeans, exposed to the same fungi, behaved as four people might during an epidemic: One got very sick, the next less so, the third had a mild attack, and the fourth proved immune.

"Nations or individuals," Albrecht says, "men or animals, we are what we eat. Breeders raise big tough mules in Missouri because of lime-rich soils that make tough bones and bodies. Farmers use a lot of those mules down South in the cotton fields, but they don't raise them there. Kentucky raises far better race horses than Florida, though some of the country's finest race tracks are in Florida. It's a matter of soil. The Japanese have a very high illness and death rate; colds are almost universal at certain seasons. The soils of Japan in large part are mineral-poor. That's the main reason why the Japs are such fish eaters; they have to eat fish to get needed minerals and vitamins. We tried a starvation experiment with male rabbits, which are naturally great breeders. When we fed certain pens of rabbits a mineral-deficient hay in their diet, we reduced the males in a few weeks to the point where they wouldn't look at a woman rabbit. Other rabbits, kept on a similar but mineral-rich diet with hay from treated soil, were regular wolves. By reversing the diets, the wolves became woman-shy, and the tame cats became wolves. Lambs fed mineral-rich hay from treated soil made nearly three times as much gain in weight in a given time as other lambs from the same flock fed the same amount of hay from mineral-poor soil. Elephants in Burma and Ceylon, when fed on sugar cane, a mineral-poor diet, quickly become unable to do the heavy timber moving required of them. A properly mineral-rich diet predisposes a man to health and normal functioning. And the healthier we are, the better we resist diseases that ought to lay us low."

To demonstrate this in plants, Albrecht took me to a greenhouse to look at an experiment. Several varieties of spinach were being fed by the colloidal-clay technique, on different diets, ranging from mineral-rich to mineral-poor. A little bug, the thrips, had somehow found his way into the greenhouse, and rows of the poorly fed spinach plants were suffering from his attacks, but not even one of the richly fed plants showed a sign of attack. They had something that enabled them to resist. It's the same, Albrecht said, when John and Jane ride on the subway and half the passengers have colds. By evening, John is coming down with a cold too. Jane stays well. The same bugs buzzed her. But somehow she had more resistance. "We are what we eat."

Another fact to remember, Albrecht said, is that soils under certain conditions easily lose a large part of their minerals. The loss



How to starve on three big meals a day. *Upper:* Soil deficient in minerals produces a crop similarly lacking; the livestock raised on it, and you who eat the livestock, suffer from "hidden hunger." *Lower:* Mineral-rich soil means fuller growth and sturdier health for the crop, for the livestock and for you.

may occur in several ways. Under heavy rainfall, minerals tend to leach out and disappear in the ground water. Under heavy cropping too, large quantities of minerals can be taken away when the crops are removed. Albrecht once calculated that a 200-acre farm producing so many bushels of oats, corn and wheat, and so much alfalfa and grass, gave up minerals which, if bought at current prices, would have cost $1630 for just one year. At that rate, if nothing else happened in the soil, two or three crops could exhaust a farm.

Luckily, two things do happen. First, farmers put back minerals in the form of natural manures and fertilizers or by plowing under green crops and crop residues. Second, the soil itself possesses a mechanism for releasing minerals naturally found in most soils, and making them available to plants. Just how this is done is part of Albrecht's revolutionary soil hypothesis. But this is what's important for us—a farmer can mine his soil by overcropping it faster than it can renew itself.

There's an interesting plot in Sanborn Field, in Columbia, which Albrecht took me to see. It's called Plot 9. Since 1886, when Sanborn Field was set aside for crop studies, Plot 9 has been planted to wheat every year. The grain and straw are always removed. Nothing is ever put back—no fertilizer, no manures, no minerals. At first, Plot 9 yielded handsomely, but as the years passed, the yearly crop got smaller and smaller, poorer and poorer. Now the soil is so sick that it can't recover enough mineral strength between crop seasons to make wheat annually, and yields only every other year.

These are Albrecht's basic facts. Much has been left out, but I have said enough, I think, to show the nature of the invisible enemy that is attacking our soils, our plants, our domestic animals, you and me. We have drawn on the mineral bank more than we have paid in, and bankruptcy is coming fast. Diseases are beginning to multiply. Heart ailments that can be traced to diet are going up alarmingly. Diabetes, arthritis, cancer, anemia, dental caries and many of the more obscure ailments have struck with increasing severity. Millions of us try to supply what we vaguely feel is wanting, by buying pills at the drugstore. Even if we aren't sick enough to see a doctor, we may be only half-well. A study in a California aircraft plant showed a correlation between fatigue, work spoilage, reduced output and absenteeism, and shortages of vitamins A and C in workers' diets. Medical progress has been wonderful, but one of the more significant medical discoveries is the fact that almost any disease can be produced experimentally by faulty food. Today, doctors in increasing numbers are the ones who are saying that the tide is getting too strong for cure alone. There must be prevention. And prevention starts in the soil.

The process of decay has gone faster and further in some parts of the country than others. Albrecht cites the fact that the South has a heavy rainfall and a lot of leaching and cropping to reduce soil minerals rapidly. The South, consequently, is the part of the country where farmers use the most fertilizer; they have to. But even so, input in most places has fallen behind outgo, and Albrecht says it's a direct result of that that makes so serious the Rountree report that in one Southern state no less than 70 of 100 potential inductees for military service in this war were rejected on physical grounds, whereas in Colorado, where mineral depletion has been less, 70 out of 100 were accepted. Those Southerners simply were not eating well enough.

The problem, Albrecht says, is rapidly reaching the size of a catastrophe, and if carried much further, could mean national suicide. Some future Gibbon, he says, might sit down to write The Decline and Fall of the American Republic. Soil health is that important. It could happen here.

Can the tragedy be prevented? If so, how? Not all the steps are known yet, Albrecht says, but the direction we must travel is absolutely clear. We must restore our soil bank account. Our soils, like ourselves, must be fed back to health. That's a tremendous subject. No two soils have exactly the same history, topography and climate, and soil-mineral differences may occur within the same fence lines. Albrecht visited a famous Hereford farm in Missouri and found an entire beef herd seriously afflicted with diseases that doctoring seemed unable to cure. On another farm near by he found a similar herd in practically perfect health. Oddly, the herd on the second farm was started by animals born and brought up on the first farm. The health difference was a soil difference. The first man had been operating for fifty years on the same farm and had not maintained soil minerals. The second man, a newcomer, had taken sound advice and built up his soils. The proper feeding of soils, Albrecht points out, is complicated by the fact that a greater variety of minerals is needed by soils than we used to think. At least fourteen elements are needed for plant construction and sixteen for animal body building. Most of these are needed in only tiny amounts, and are called "trace elements"; but though little is needed, if that little is missing, the soil, plants and creatures feeding on the plants may be noticeably sick.

Remarkable work has already been done in treating sick soils. After adding a pinch of manganese in certain fields, a food processor harvested tomatoes with triple the vitamin C content. A little boron around apple trees in the Northwest apparently has doubled the vitamin A content of the fruit. A retiring genius named Albert Carter Savage has been experimenting for years in Kentucky with mineralized vegetables, and a number of sick people fed at his farm have achieved near-miraculous cures. Citrus groves in Florida are planted on sand under fifty annual inches of rain, and to furnish the trees the copper and zinc they can't find in the soil, they are spoon-fed—the minerals are sprayed on and the trees take them in through their leaves. The iron content of milk has been increased from twenty-one to fifty-five parts per million by proper feeding of soils grazed by the cows. But Albrecht warns that there are no soil cure-alls. "The soil factory," he points out, "runs by processes more subtle than anything in a man-built factory. Much remains to be known. Lime is generally good on soils, but it's possible to lime too much. Boron helps to make oranges, but an overdose can make them sick." All these things are to be explored. But Dr. Jonathan Forman, editor of the Ohio State Medical Journal and a serious student of soils and nutrition, says confidently that there is no reason why the average man, if "well-bred and well-fed," should not live to be a hundred and enjoy good health.

The city man is perhaps more deeply concerned in all this than the country man, for he is not a producer of his own food and must depend absolutely on others for the mineral richness of what he eats. So the city must learn to be tolerant of new steps that farmers must take, and of the possible consequences of those steps to the city man's pocketbook. Hitherto, Albrecht says, the farmer, thanks to the system of food distribution, has often been forced to mine his soil. "Hardly any farmer," he says, "willfully destroys soil fertility. But he has been forced. The grocer says, 'I can pay only so much.' He passes that buck to the wholesaler, the wholesaler passes it to the commission man, the commission man passes it to the farmer, and the farmer passes it to the land. There's no other place. He proceeds to use his soil like a private gold mine, not as a property affected with an enduring public interest. We must enable farmers to keep on using their soil to produce food, and at the same time maintain mineral-rich fertility."

Our war-expanded chemical industry, Albrecht thinks, will find its greatest peacetime opportunity in making soil-restoring products that will help to restore our national health. The greatest challenge of all, he says, is to research.

Reprint No. 21

LEE FOUNDATION FOR NUTRITIONAL RESEARCH
Milwaukee, Wisconsin 53201