Alfreda F. Raabe

Food Quality from the Soil

By WM. A. ALBRECHT, Department of Soils, College of Agriculture, University of Missouri

WITH ever increasing population densities and increased efficiency of agricultural practices that permits farmers to raise larger and larger crops per acre, a new and very important, perhaps even menacing, factor is beginning to appear in man's food supply. This is discussed by Professor Wm. A. Albrecht, Chairman of the Department of Soils of the University of Missouri, who is one of the first to study certain of the most important relationships between the *quality* of the food supply as measured by its capacity to supply needed vitamins and minerals for health and vigor and the character of the soil in which the food is grown.

Man's environment, which determines his health and character, includes the food which he eats and of necessity the soil on which that food was grown or the animals for meat or milk production were fed.

Professor Albrecht has traced in the accompanying article the great importance of soil characteristics and soil constituents in determination of animal and human health and welfare. He has found that the "dumb animals," which still rely chiefly upon instinct for their choice of food, can recognize subtle chemical and biological characteristics that have so far been beyond the skill of the chemist and physiologist to measure or determine. As our soils and our civilizations become older, this question is bound to become one of most vital importance to human health and survival. Perhaps not long hence, consumers will want to know not only who made the flour or processed the meat, but *where* the wheat ground to make the flour was grown or the cattle were grazed and fed, for it is clear that food grown in one region may mean health and strength and in another may mean physical deficiency, weakness, inability to produce normal offspring, even actual illness or disease.

QUALITY of food rather than its bulk is now coming to the forefront of popular attention. We are no longer thinking primarily of the grocer's shelves as the source of food, but of the soil where it was grown. The realization is dawning that our bodies are built from the ground up.

The deficiencies of food are readily noticeable when they take the form of shortages in quantity or bulk, or when "red point" foods are restricted on the shopper's list. Yet the less obvious food failures due to lowered quality are even more serious because they deny us good health. Their shortcomings in this respect have given us ailments caused by malnutrition, and "inside troubles" that have too often been mistaken for infections from the outside.

More recently the positive aspects of food have drawn attention as we learn that *high quality in food* is the surest means of keeping us healthy, buoyant, good-natured and more efficient in our daily output. Localities like Hereford, Texas, which has become known as "the town without a toothache," as well as animal assays of the fertilized crops, are all pointing to the soil as the foundation on which good food, good health, and sound bodies are built.

"Different plants grow on different soils" we say as a matter of course, but we fail to see in that remark the more important corollary that plants are different because different soils make them so by feeding them

Reprinted from Consumers' Research Bulletin of September 1945
CONSUMERS' RESEARCH, INC.
WASHINGTON, N. J.

TVA Photo

The animals are careful selectors of their feeds according to quality when given an opportunity to discriminate. They make better growth when they can select from the available herbage that which is best adapted to their nutritional needs.

differently. Plants, first, and animals, next, are successive stages in the assembly line of a factory fabricating our foods from the raw materials of the soils on which they grow. The soil contributes about a dozen of the sixteen or more elements that go into the building of plants, animals, and our own bodies. These dozen make up only 5 per cent, by weight, of the final product, but they determine whether or not the other four elements coming from air and water will be fabricated into something more than fuel substances only—sugar, starch, cellulose, and wood. These products of air and water—that is, of the weather—provide the energy that men or animals utilize. They are the fattening or the "go" foods. It is the soil and its fertility that provide the "grow" foods, the proteins, the vitamins, the minerals, and many other complexes for building and reproducing our kind. Weather readily gives food with bulk and food energy, but leaves us with "hidden hungers." On the soil and its fertility depend our satisfaction and good health.

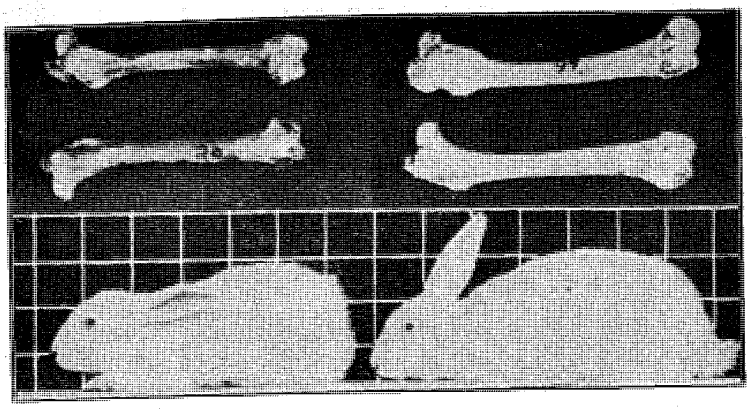
The dumb animals have long been demonstrating their choice of foods in terms of quality. The grass really is greener—and more nutritious—out on the highway or railroad right-of-way where the crops have not been harvested and the fertility of the soil has thus not been depleted.

The cow "risking her neck" on the barbwire fence failed until recently to inform us of this truth, but received a yoke for her neck as evidence of our ingratitude and lack of understanding. Cattle have selected the drill rows of barley that had been given two hundred pounds of fertilizer, while they disregarded the very next drill rows that had received only half that much enrichment of the soil. Cattle have been selecting one of four haystacks annually in the same field *for eight years* because that stack had in its hay from twenty acres, hay from some five acres that were once given a top dressing of fertilizers.

Hogs have selected and hogged down first the area of a forty acre field where alfalfa, grown years before, had been given lime and phosphates. "Even the pig if given a chance to select his ration will make a hog of itself in less time than we can" was the way Professor Evvard of Iowa put it. Animals are connoisseurs of the quality of their feeds as deter-

Photo, Virgil Burk, County Extension Agent

In this 40-acre cornfield the hogs ate first the corn in parts where the soil had once been limed for alfalfa. Cliff Long Farm, Warrensburg, Missouri.



Missouri Agric. Experiment Station Photo

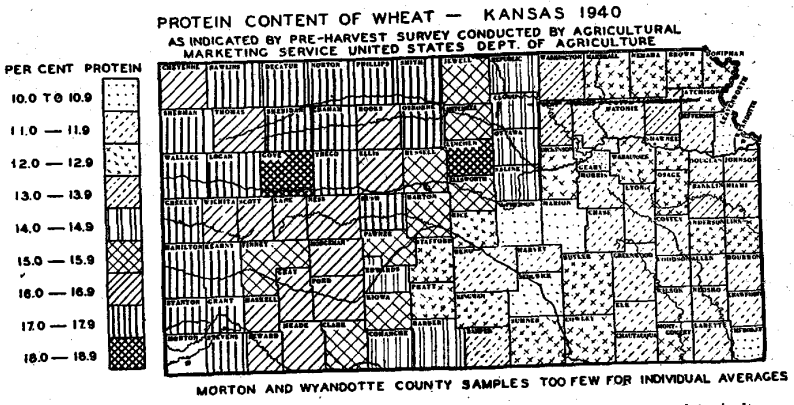
Better animals and stronger bones, better fur and better other products result from better soils. Quality of feed must be "grown in" from the soil. The picture shows the difference in size and bone characteristics of two rabbits, one feeding on herbage raised on soil without mineralization; the other on properly fertilized soil.

mined by the soils that produce them.

Humankind, too, in a general way have localized their foods according to the fertility of the soil. "Soft" wheat has been said to grow in regions of higher rainfall while "hard" wheat was considered common where there is lesser rainfall. The truth of the matter is that hard wheat is a mineral-rich, high-protein output by the plant in localities where the lower rainfalls and less intensive cropping have left more fertile soils. Soft wheats are mainly starchy grains that represent bulk of chemically reacting and concentrated water, air, and sunshine, accumulating where too little fertility of the soil is left to fabricate proteins, provide minerals and build food quality equal to that of hard wheat. In the soil is to be found the reason why the harder wheats taken as a whole make bread the true staff of life.

Soft wheat is going west. High yields of crops for several successive years have removed fertility so rapidly that wheat varieties formerly considered "hard" wheat have gone "soft," to the disgust of the bakers. Quality in this case *must be grown into the grain*, and equivalent quality cannot be thrown into the milled products by chemical helps or additions.

It may seem strange that the American bison should have roamed over about the same territory over which "hard" wheat grows. But this big beast of heavy bone and ponderous brawn was a grass eater only. He made no trading post purchases of either protein concentrates or minerals to supplement his diet. This same soil area is today the seat of the "range" cattle that literally raise themselves as did the thundering buffalo herds of long ago. Cattle go eastward for their "finishing schools," to be fattened where the "soft" wheat grows. Hogs are grown there, too, by help of extra nutrients "shipped-in" in the form of wheat bran and are then fattened on corn. The quality needed in a "grow" food is provided by growth on the more fertile, mineral-rich soils in the western area. The fattening power of a "go" food is provided by growth on quite another soil of lower mineral fertility. Growth requires a higher biologic quality of feeding stuffs than mere fattening, as the fats in the body are produced by simpler raw materials than constitute the flesh and



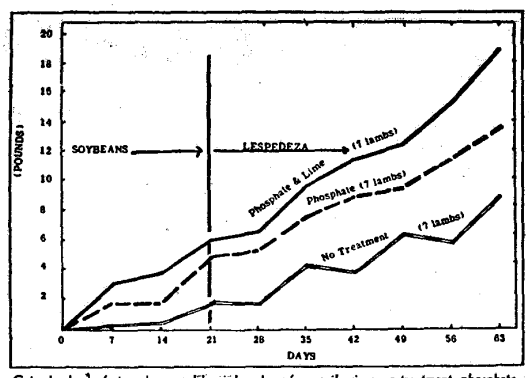
Marketing Service, U. S. Dept. of Agriculture

The wheat plant as a manufacturing business of making protein has a bigger output as the soil is less leached. (Centuries of leaching or subjection to percolation by the water of rainfall and melting snows remove much valuable mineral matter from the soil.) Using the lower tier of counties in Kansas to go from east to west and from 37 to 17 inches of rainfall, the protein of wheat goes up from 10 to 17 percent. The character of the wheat is determined more by the fertility of the soil than by the rainfall, whence the harder, more mineral-rich food grain comes from the region of higher fertility and lower rainfall; thus soil rather than weather determines nutritional quality.

growth materials, the proteins, vitamins and minerals.

Feeding trials of animals as well as their discriminating choices in utilization of food are calling attention to the quality of the food as grown into it. Gains by sheep have been much larger from hays grown on soils given lime and phosphate than on hays from soils without these fertility treatments, hays which look the same and are the same as judged by ordinary chemical and agronomic tests. Rabbits under similar tests have demonstrated better growth and better reproduction when feeding on forage produced on fertile soils. All of these improvements occurred *without increases in the bulk of foods consumed.* For most people, better health is not a matter of eating *more* food, but one of eating *better* food, better because the plants manufacturing it were well supplied by the soil with those essential elements from which quality food can be fabricated.

Garden vegetables, like the greens in particular, are now being examined for their food quality according to the soil quality producing them. Spinach has demonstrated alarming variations in its content of minerals—the very element for which it has been so much heralded. As a producer of bulk and verdant green it does well if given plenty of nitrogen. But, as a deliverer of calcium and other minerals, it is too often a gross deceiver when limited by deficiencies of the soil. Then, in addition, it may make of itself so much oxalate as to convert not only its own mineral calcium into undigestible forms, but also may change to this condition some of the calcium of milk usually fed to babies along with it. Other vegetables, too, are coming into prominence because like spinach "they are easily grown" and for that reason are making bulk, but may be deceptive in quality. Those that require fertile soil and "are hard to grow" may after all be the quality foods. There is much to be done by way of the choice of what we grow, and then by way of improving the fertility of the soil on which it grows.



Gains by lambs fed soybean and lespedeza hays from soils given no treatment, phosphate, and lime plus phosphate. All received same supplement of wheat bran and shelled oats.
From Missouri Agricultural Experiment Station

The soil is after all the basis of life. Its contributions may be only the handful of dust into which the warm, moist breath of creation is blown. It is essential, nevertheless, that even that small amount of soil contain all the dozen elements needed, otherwise even the crowning product of creation may lack a sound healthy body and have instead a bulk that is mainly the product of the water and air we call weather. Quality in our foods, and thereby health in our bodies, must be built from the ground up.