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Of Professor Truog, Harper's says that he is the originator of the Truog Soil Tests, a past president of the American Society of Agronomy, and consulting editor of *Soil Science*. But it introduces his article in these words:

"An extraordinary phenomenon in American farm history—and in book-publishing history, for that matter—has been the furore over Edward H. Faulkner's *Plowman's Folly*, which argues that the great enemy of American agriculture is the mould-board plough. The book has already sold more than 50,000 copies, and orders are coming in faster than the publishers can fill them. It is a subject of fierce debate in farm circles; in some Western communities it has become the staple subject of conversation. Discovering that many farmers are becoming half-converted, Professor Truog rises in the defence of the plough."

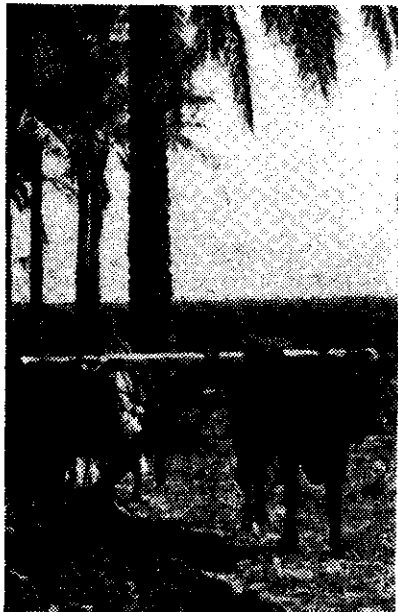
Truog Says:

"Right at the start, let's acknowledge that we are doing too much ploughing in some sections of this country. Then, having made that clear, let's go on to say that it is nonsense to maintain as Edward H. Faulkner does in *Plowman's Folly*, that the mouldboard plough has sapped the soil of its fertility, raided the nation's food basket, fostered crop pests, and even paved the way for the current vitamin-pill fad.

"The evangelist of *Plowman's Folly* bases his gospel largely on his own supposition that crop roots tend always to develop very near the surface soil. (This is not true, as I will later explain.) The mouldboard plough, he argues, buries fertiliser and green manure well below the surface, and thus beyond the reach of crop roots, and as a result the released nutrients are of no value to the plants.

"Secondly, Faulkner also visions the manure and surface residues, buried under the furrow, as a sponge layer which absorbs water as blotting-paper absorbs ink. This layer of decaying organic matter draws water from the soil above, Faulkner explains, and also interrupts the capillary rise of water from the sub-soil below. As a result, Faulkner believes, an artificial drought is produced in the surface soil, where the plants are rooted.

"His third important point is that ploughing is a violation of Nature's laws; he explains that Nature has done very well without ploughing, as exemplified by her giant redwood trees,



Is this Egyptian misguided?

tropical jungles, and pampas grass. The naked turned-over soil which the plough leaves, Faulkner continues, is bare to the wind, rain and sun. Eventually, these agencies ruin the topsoil and even remove it by erosion or wind.

"Warming to his subject, the author claims that tillage with the disc harrow—or some other implement of shallow cultivation—will cancel all the plough's follies, and in addition eliminate weeds, make food richer in vitamins, prevent crop diseases, and foil insect pests. Some of the advantages of using the disc harrow, as he sees them, are: (1) The sod and manure rubbish would be left near the surface—just right for the shallow roots. (2) This surface mulch would hold rain water at root level and prevent erosion. (3) It would prevent dust-bowl disasters by serving to anchor the topsoil against the winds.

Rooting Habits of Plants

"If we are going to examine Mr. Faulkner's arguments, we must become acquainted first of all with the rooting habits of common crop plants.

"In our Soils Building on the University of Wisconsin campus, there is a large glass case containing uprooted plants at various stage of growth. Oats, corn, clover and other plants were carefully dug out by a special technique, leaving all of their roots intact, and placed in this case some 50 years ago by Professor F. H. King. Many of the roots of these plants extend to a depth of two or three feet, and some much deeper. Less than one-fourth of the total mass of the roots is found in the three-inch surface layer where Faulkner contends that the great bulk exists.

"Investigations throughout the world regarding the root development of crop plants have confirmed King's findings. Anyone who wishes to investigate root development for himself must remove the soil slowly and very carefully—preferably by a special technique, using water under pressure. When a plant is pulled up, most of the roots (and all the deep ones) usually remain in the soil, which accounts, in part, for the misconception concerning their length.

The "Blotter" Theory Attacked

"Actually, there is little basis for Mr. Faulkner's contention that ploughed-under organic matter acts as a blotter and steals needed moisture from the roots of growing crops. Calculation based on precise information shows that if 40 tons per acre of manure were ploughed under, this manure in itself could hold only about one-tenth of an inch of water, that is, one-tenth inch of rainfall; and much of this water would be available to nourish plant growth just as is water held by the soil proper.



EDWARD FAULKNER: Is he talking sensibly or through his hat?

"Careful investigations have also shown that the capillary rise of water in soils is always rather slow. That is one reason why some plants, like corn, have developed the habit of going after the subsoil water by means of deep roots. Most crop plants go after the water rather than waiting for the water to come to the roots near the surface. If they did not, they would dry up in midsummer like bluegrass.

"As a matter of fact, it is fortunate that water does not rise too rapidly in soils by capillary movement (similar to the movement of oil up a lamp wick to the flame), for the top soil becomes so warm and the air movement at the surface is so rapid that evaporation and loss of water would be extremely serious. Owing to the slow water movement, however, the evaporation during warm weather runs ahead of the capillary rise, and as a result, a two to three-inch layer of very dry soil is formed near the surface. This layer of dry soil acts in two important respects: (1) Since it is very dry, it fails to function efficiently in bringing water to the very surface where it would be lost rapidly because of active air movement and relatively high temperatures. (2) It serves as a good insulator for preventing the water underneath from becoming so warm that it would vaporise and escape right through the layer of soil.

"Thus the layer of soil in which Faulkner proposes we do our farming must be dry much of the time so that it may serve as an insulator for the soil below, where plants obtain most of their water and nutrients. And since crop plants obtain most of their nutrients below the surface layer, the farmer must plough to place manure and crop residues where it is moist, so that they can function most advantageously.

Three More Reasons

"Faulkner says that in all of his experiences no one has ever advanced a scientific reason for ploughing. I have just given one. Briefly, here are three more:

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