oil is delicate work

thing is returned to the soil; the end result hurts the soil, the crops, animals, and the farmer.

oehle's portant s that: nto the e bare,

instead of allowing water to run off with valuable top soil. Too much manure on a field can be detrimental to cattle who eat crops from that field. Manure without straw concentrates salts and in turn will bring about imbalances which create problems.

Cover crops used as 'green manure' are virtually of no value if humus is to be developed from them. A soil can be worn out, and will be, unless it is periodically restored to its healthy and productive state. The pH level of soils is dependent on much more than the presence of Calcium, and adding that compound to the soil will not always cure imbalances, even though it will change the pH level Fertilizer bills can be reduced if soils are tested accurately and completely.

int with more than a dozen bottoms, the plow is now being

Root development and the movement of air and water are severely restricted by the tightly compacted layer of soil on which the plow has been riding for years and years.

narrower distance wouldn't allow for sufficiently deep penetration and wider spacings aren't as effective. Chisel-plowing should always be done in the fall to allow for water penetration throughout Winter and Spring and more decay of incorporated organic matter such as corn stalks and straw.

How often should a field be chisel-plowed? Boehle suggests that it be done the first two years in succession, and thereafter every three or four years. While chisel-plowing by itself is an important tillage practice, it won't get the job done by itself. Boehle recommended that an offset disks also become a part of the tillage program, adding that the angle of the disk is very important. The common plow has no place in the Brookside Farms recommended tillage program. A zero-tillage practice is also frowned upon by the firm, which currently has more than 10,000 farmers subscribing to its research programs.

"Zero-tillage," Boehle related, "causes the soil to become hard and more disease prone. You'll have more weeds and after a period of time you return nothing to the soil. The hard soil in turn affects water and air movement and causes imbalances in physical, chemical, and biological relationships," he added.

Crop residues are an invaluable part of soil nutrition and management. How the farmer utilizes these residues can greatly affect fertilizer requirements and crop yields, according to Brookside Farms research, which has been going on for 30 years.

Admitting that a field which has all residues turned under completely will look nicer than one which has bits and pieces of straw or stalks visible all over the place, Boehle said crop residues should not be turned under completely. Rather, they should be "incorporated" into the soil — that is, mixed with it in such a way so that much or most of it remains in contact with the air. Even if residue is plowed under, the benefits of the organic material can be increased greatly if some of it is allowed to stick out between the furrows. The reason for it is because material which protrudes above the surface will actually pull water and air into the soil, which is vital for good soil fertility.

If crop residues are completely turned under, they have a tendency to block the movement of water and air. This is especially true if the condition exists along with a plow sole. Crop residues will then become waterlogged and air is virtually cut off to allow proper decay. What happens is that anaerobic bacteria move in to work on the debris. Alcohol is produced — this sterilizes the affected area — and in more advanced stages the anaerobic bacteria produce fermaldehyde — a preservative. The end result is that no decay takes place and the farmer plows up this year's preserved crop residues next year. "You'll have lost the benefits of crop residues," Boehle warned.

But if crop residues are incorporated into the soil, it encourages acid production and the formation of beneficial organisms which in turn increase soil fertility, Brookside Farms research shows. "What's important here," Boehle added, "is that the soil fertility is improved on its own process, without adding something which wasn't there before."

Brookside Farms, which does consulting and testing work for North American farms (most of them in the Midwest) totalling approximately 40,000 acres, also has a different approach to explaining the pH reading, a part of most every soil test. Boehle likened the pH reading of a soil to the temperature reading of a thermometer. "It tells you something isn't right, but it doesn't tell you what the problem is nor how to solve it." Contrary to the popular belief that lime holds the key to correcting low pH levels, Brookside Farms claims that more complete testing of the soil is needed before an accurate recommendation can be made. Oftentimes lime is used to "cure" the situation when it wasn't really needed, the firm's spokesman added.

According to their research, pH is affected by a number of elements, including Clacium, Magnesium, Potassium, and Sodium. Of these Calcium is the most important, but Boehle also stressed that Calcium and Magnesium must be in the right relationship to each other because they affect the values of the remaining chemical properties. "Thus an imbalance in one area can affect soil symptoms in another area when analysis takes place. The soil can only hold so much and it needs so much — keeping it all in balance is the key to maintaining a healthy soil. This in turn can affect the health and productivity of animals which eat crops from that soil." In the opinion of John Campbell, many of our cattle and dairy problems today can be tied directly to mismanagement of our fields.

In a manner of speaking, Brookside Farms audits soil samples to spot shortages of components, Boehle explained. In doing this, the firm works with what is called

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