



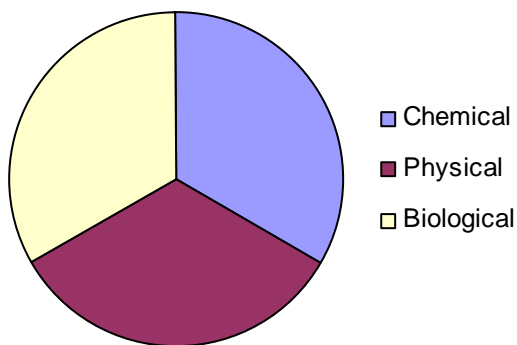
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## SOIL SPHERES: THE KEY TO BETTER PRODUCTIVITY

Soil is the foundation of every farming operation. Whatever it is that you do on your farm, it all begins with the soil. By implication then, if you want to get the best from your farm, you need to get the best from your soil. The way to do this is by improving your understanding of this valuable resource which lies hidden, and largely forgotten, beneath your feet.

“What is soil?” and “What does it do?” Pause for a moment and think about how you would answer these questions. Can you give clear, concise and straightforward answers to them or is the information in your head a bit jumbled and muddled?

In reality, there is no one “right” answer to these questions. However, it is often useful to have an overarching framework or big picture view of what we are talking about. This helps to focus and crystallise our thoughts. One such viewpoint, as illustrated in the accompanying diagram, is to regard the soil as three interrelated spheres: chemical, physical and biological.



The chemical sphere, as its name suggests, encompasses the chemical properties that help describe the soil i.e. pH, Olsen P, sulphate, cations etc. These are familiar to most farmers because most basic soil tests are derived from the chemical sphere. Properties such as these inform about the supply of nutrients and, depending on the test, they can also tell something about the cycling and storage of nutrients as well.

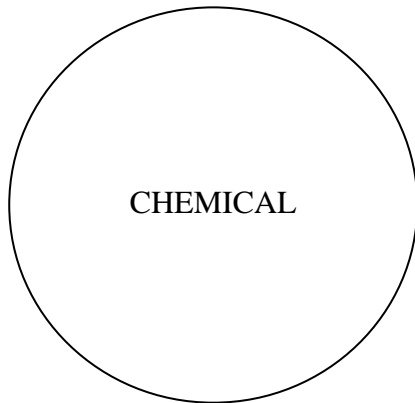
The physical sphere relates to a different set of properties which detail how the soil components are arranged. These encompass properties such as structure, texture, porosity, water holding capacity and organic matter. Though these properties are not generally tested, they are just as important to the overall functioning and performance of the soil as the chemical properties outlined above.

The biological sphere is, as its name suggests, the realm of soil organisms. Every soil comprises significant populations of living animals, microbes, fungi, plant roots etc as well as the residue of

these different species after they die. These in combination with dead roots, stems, leaves and animal dung etc generate the soil organic matter, which is a key component in the overall functioning of any soil.

The chemical, physical and biological spheres do not function in isolation. They are mutually independent and interact with each other i.e. the biological sphere stores many of the essential chemical plant nutrients. Yet plant access to these nutrients depends on good physical properties.

Because most soil tests are generally derived from the chemical sphere alone, there is a tendency to view the soil as the chemical sphere alone as in the accompanying diagram:



This is also the reason farmers struggle to understand why they are not generating better production even though nutrient levels may be optimal or better than optimal. There may be a problem in either the physical or biological spheres, or maybe simply an imbalance of nutrients in the chemical sphere.

Collectively, the chemical, physical and biological spheres are the setting for a wide range of dynamic soil processes. These facilitate water, nutrient, air and heat exchange, both for soil organisms and the plants embedded within the soil. They also impact the degree to which water runs off the land, infiltrates into it or is stored by it, which of course has an important bearing on both plant nutrient availability and environmental pollution.

Most of the soil biological activity and chemical nutrients are found in the topsoil, which also has the best physical structure – unless damaged by cultivation. Chemical nutrient losses can be offset by fertilisers but it takes time for good soil biological and physical features to develop.

As you grow in your ability to appreciate the interrelationship between these soil spheres, the better you will understand both how your soil functions, and therefore, how to get the best from your soil and from your farm.