Liquid carbon pathway unrecognised

At cropping conferences when soil carbon is discussed, a conclusion usually drawn is that it is not possible to lift levels to a significant extent in a short timeframe. Most scientists contend carbon is a useful factor to consider for agronomy but not for sequestration. But Dr Christine Jones disagrees. She contends soil carbon can be increased quickly for both purposes and that most scientists are using a flawed model to measure carbon.

Christine Jones is rekindling awareness of a biological pathway for quickly increasing carbon in depleted cropping soil. Existing models she says don't account for the pathway and significantly underestimate the potential of cropping soils to sequester carbon.

A soil carbon improvement of only 0.5% in the top 30 centimetres of 2% of Australia's estimated 445 million hectares of agricultural land would safely and permanently sequester the entire nation's annual emissions of carbon dioxide. Sequestering atmospheric carbon in soil as humified organic carbon would also restore natural fertility, increase water-use efficiency, markedly improve farm productivity, provide resilience to climatic variation and inject much-needed cash into struggling rural economies.

The 'soil solution' to removing excess carbon dioxide (CO_2) from the earth's atmosphere is being overlooked because current mathematical models for soil carbon sequestration fail to include the primary pathway for natural soil building.

The process whereby gaseous CO_2 is converted to soil humus has been occurring for millions of years. Indeed, it is the only mechanism by which topsoil can form. When soils lose carbon, they also lose structure, water-holding capacity and nutrient availability.

Understanding soil building is thus fundamentally important to future viability of agriculture. Rebuilding carbon-rich topsoil is also the only practical and beneficial option for productively removing billions of tonnes of excess CO_2 from the atmosphere.

'Biological sequestration' begins with photosynthesis, a natural process during which green leaves turn sunlight energy, CO_2 and water into biochemical energy. For plants, animals and people, carbon is not a pollutant but the stuff of life. All living things are based on carbon.

Besides providing food for life, some of the carbon fixed during photosynthesis can be stored in a more permanent form, such as wood (in trees or shrubs) or humus (in soil). These processes have many similarities.

i) Turning air into wood: Formation of wood requires photosynthesis to capture CO_2 in green leaves, followed by lignification, a process within the plant whereby simple carbon compounds are joined together into more complex and stable molecules to form the structure of the tree.

ii) Turning air into soil: The formation of topsoil requires photosynthesis to capture CO_2 in green leaves, followed by humification, a process within the soil whereby simple carbon compounds are joined together into more complex and stable molecules to form the structure of the soil.

How can it be that trees are still turning CO_2 into wood, but soils are no longer turning CO_2 into humus?

The answer is quite simple. In order for trees to produce new wood from soluble carbon, they must be living and covered with green leaves. In order for soil to produce new humus from soluble carbon, it must be living and covered with green leaves.

Building stable soil carbon is a four-step process that begins with photosynthesis and ends with humification. The humification part of the equation is absent from most broadacre agricultural produc-