CQ BestPractice Newsletter

May 2011

Regenerating soils in CQ

With Dr Ashley Martin and Bart Davidson

The topics of managing degraded soils and understanding how soil microbes can affect the health of plants were high on the agenda at Springsure Golf club on the 1st April. Thirty five producers and extension staff from around the central Queensland region attended the special one day program, "Regenerating Soils in CQ". This program was designed as a support day for local producers to learn more about the importance of managing soil microbe populations and nutrition of their crops and pastures, from two of the top Australian specialists. The topics have become even more relevant since the floods in early 2011 and the widespread loss of crops and pastures due to waterlogging and inundation.

The presenters included, Dr Ashley Martin, CIAAF Adelaide, who is a specialist soil microbiologist and Mr Bart Davidson is a biologically based agronomist, based at Moree and working with hundreds of farmers and graziers across Australia.

Dr Ash Martin, CIAAF at Springsure.

The two presenters explained the basis of managing nutrients in soil to maximise the ability for plants to function effectively. Dr Martin enlightened the large group on the role each species of Bacteria, Fungi, Protozoa and Nematode play in the cycling of nutrients, decomposing of trash and suppressing disease. He said, one gram of soil contains:

- more than 100,000,000 bacterial cells
- more than 11,000 species of bacteria and a myriad of Fungi and other microbes.

Dr Martin said, healthy soils can produce much of, if not all of the nitrogen our plants require for growth and production (including the fertiliser). He added, our atmosphere is 78% nitrogen and all we have to do is get our microbes to cycle it to the soil and the plants. He added, In fact healthy soils are able to fix up to 200kg N per year, when well managed. That would mean, we would need little if any N based fertilisers in the production of crops or pasture. The primary microbes which facilitate this process include: Actinomycetes (free living bacteria) and Rhyzobia (plant symbiotic bacteria)

Australian Government
Department of Agriculture, Fisheries and Forestry

Regenerating soils in CQ (cont.)

He explained, it is important to reduce the impact on microbes before you can build healthy soils. Mr Martin, has conducted many microbial tests on soils in central Queensland, which he used as examples to explain management practices. He continued, The waterlogging in recent months had a serious impact initially on the microbe populations as good microbes are generally aerobic (requiring oxygen) and the oxygen in the soil would have been utilised within a couple of days. Therefore, extended waterlogging will have caused large microbial deaths. The best solution to this issue is to aerate the soil as soon as possible by way of a form of renovation or getting a plant to grow in the soil.

Mr Davidson, explained the importance of understanding the balance of nutrients in the soil. As an example, in central Queensland soils, if the soil had an excess of magnesium to calcium, then the magnesium can tie up many other nutrients and limit the ability of microbes to do their job. He explained the nutrient balance is like creating sound foundations for the microbes to live and cycle. Often this is overlooked in assessing nutrition or is deemed to be simply too hard to manage. However, if it is not managed, the crops will not achieve optimum yields. Mr Davidson said, nutrients such as nitrogen and phosphorous are the biggest cost for most producers, when they will most often not be the most limiting factor. These and all nutrients need to be better managed.

For more information on soil and plant monitoring, phone 1300780872 or go to the www.grazingbestprac.com.au website or info@ciaaf.com or ph: 08 7127 8982 or 08 7127 8982

CHRRUP

Big event planned for June Workshop—

SOIL & PLANT NUTRITION In a variable climate

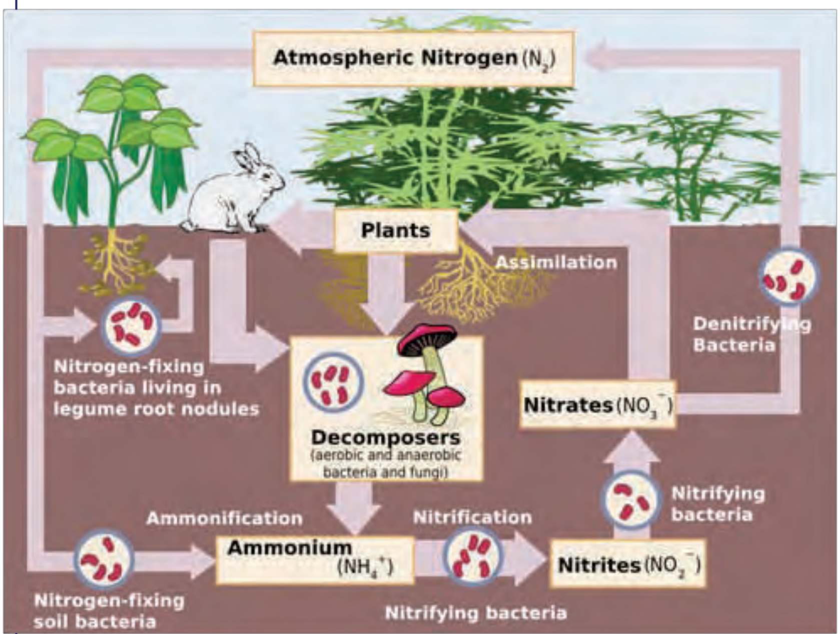
Where: Clermont
When: 8th June
Who: Bart Davidson
Cost: $30/ person

Be quick to book—this is essential for all producers.

Understanding the Nitrogen cycle

Adapted from Wikipedia (website)

The **nitrogen cycle** is the process by which nitrogen is converted between its various chemical forms. This transformation can be carried out via both biological and non-biological processes. Important processes in the nitrogen cycle include fixation, mineralization, nitrification, and denitrification. The majority of Earth's atmosphere (approximately 78%) is nitrogen, making it the largest pool of nitrogen. However, atmospheric nitrogen is unavailable for biological use, leading to a scarcity of usable nitrogen in many types of ecosystems. The nitrogen cycle is of particular interest to ecologists because nitrogen availability can affect the rate of key ecosystem processes, including primary production and decomposition. ***Human activities such as fossil fuel combustion, use of artificial nitrogen fertilizers, and release of nitrogen in wastewater have dramatically altered the global nitrogen cycle.***



Diagram— Nitrogen Cycle—source Wikipedia website

Nitrogen is crucial for any life on earth as it is:

⇒ a component in all amino acids,
⇒ is incorporated into proteins, and
⇒ is present in the bases that make up nucleic acids, such as DNA and RNA.

In plants, much of the nitrogen is used in chlorophyll molecules, which are essential for photosynthesis and further growth. Although earth's atmosphere is an abundant source of nitrogen, most is relatively unusable by plants.

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3 Chemical processing, or natural fixation (through processes such as bacterial conversion—see rhizobium), are necessary to convert gaseous nitrogen into forms usable by living organisms. This makes nitrogen a crucial part of food production. The abundance or scarcity of this "fixed" form of nitrogen, (also known as reactive nitrogen), dictates how much food can be grown on a piece of land.

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5 Atmospheric nitrogen must be processed, or "fixed", to be used by plants. Some fixation occurs in lightning strikes, but most fixation is done by free-living or symbiotic bacteria. These bacteria have the nitrogenase enzyme that combines gaseous nitrogen with hydrogen to produce ammonia, which is then further converted by the bacteria to make their own organic compounds. Most biological nitrogen fixation occurs by the activity of Mo-nitrogenase, found in a wide variety of bacteria and some Archaea. Some nitrogen fixing bacteria, such as *Rhizobium*, live in the root nodules of legumes (such as peas or beans). Here they form a mutualistic relationship with the plant, producing ammonia in exchange for carbohydrates. Nutrient-poor soils can be planted with legumes to enrich them with nitrogen. A few other plants can form such symbioses. Today, about 30% of the total fixed nitrogen is manufactured in ammonia chemical plants.

There are four ways to convert N_2 (atmospheric nitrogen gas) into more chemically reactive forms:[2]

1. Biological fixation: some symbiotic bacteria (most often associated with leguminous plants) and some free-living bacteria are able to fix nitrogen as organic nitrogen.

2. Industrial N-fixation: Under great pressure, at a temperature of 600 C, and with the use of an iron catalyst, atmospheric nitrogen and hydrogen (usually derived from natural gas or petroleum) can be combined to form ammonia (NH_3).

3. Combustion of fossil fuels: automobile engines and thermal power plants, which release various nitrogen oxides (NO_x).

4. Other processes: In addition, the formation of NO from N_2 and O_2 due to photons and especially lightning, can fix nitrogen.