

Measurable Success from Biological Programme

A new independent study highlights the longer term potential benefits to agriculture through a focus on soil health. Florent Cotton, a fourth year student from the French agricultural university of Esitpa spent five months in New Zealand studying the OUTGRO system, factoring in all three aspects of the soil (chemical, physical and biological).

The study summarises 4 years of data collected from 30 Manawatu/Wanganui and Hawkes Bay region grazing systems. The soil and herbage data analysed by Hill Laboratories showed significant improvements in fertility, pH and organic matter levels in properties using the OUTGRO customised fertiliser programme.

Bucking a national trend for declining soil carbon levels in NZ dairy systems, the data shows that when soils are managed biologically, carbon levels are on the increase.

The Hills Laboratory data showed the 30 properties under the OUTGRO system increased their average soil carbon levels from 63 t/ha to 74 t/ha (see Graphic 4). The carbon in organic matter is essential for maintaining soil health, through good soil structure and moisture and nutrient retention. For example a 1% increase in soil carbon (to 30 cm) results in an additional 144,000 litres/Ha^[1] in water storage. Over a year due to seasonal wetting and drying cycles this stored water can equate to an extra 75 litres per metre². These increasing carbon levels are one indicator that the hardiness and efficiencies of these farming systems are improving.

Contrary to common opinion, it is not nitrogen which is the most limiting factor to production; first comes oxygen, and then water. If plant roots and soil microbes do not have adequate air and water movement, then quality pasture growth will be impacted requiring more fertiliser to maintain production. Ensuring air and water moves unhindered into the soil is simply the basic foundation for any long-term sustainable farming system.

When the rains eventually arrived this year a collective sigh of relief was heard across the country, yet how many would be surprised, or shocked even, to consider how much of that rainfall was truly effective? Did those first rains actually soak in, run-off, or puddle on the soil surface to evaporate later? Assessing the function of the water cycle gives key information about the productivity of a farm.

Under an OUTGRO Fertiliser programme soils become more open and begin to function more like a sponge. Whilst soils with lower organic matter, low pasture cover, inactive biology and imbalanced nutrient ratios, can become compacted impeding air and water movement resulting in limited plant growth and quality.

The study shows how soil friability increased over the 4 years under the OUTGRO programme. Using a penetrometer, soils resistance is measured (in PSI) to assess the depth where soils become compacted. Root, air and water movement are restricted at 350 PSI. The lower the PSI reading, the more oxygen which is available for soil life and also the more easily the roots of plants, nutrients and water can penetrate through the soil. In 2009, across the 30 sampled properties an average compaction layer was measured at 164 mm depth; after four years on the OUTGRO fertility programme this layer moved to 450mm. This significant change now allows deeper rooting depths and more plant access to water and nutrients. The laboratory tests also showed an increase and / balancing of most of the nutrients in the pasture.

While scientists have been engineering plant species to grow deeper roots, these farmers have achieved the same results in less than four years through improved soil health (see Graphic 13: evolution of rooting depth) with roots growing deeper from an average of 160mm to 260mm from 2009 to 2012. This directly relates to farmer observations that their pastures held on longer and then bounced back quicker following the drought. The study, published on the OUTGRO website, is timely support for what has been disparagingly called 'anecdotal' for years; that healthy soils produce more resilient and quality pastures.

Undoubtedly the weather is out of our control; however how we manage our soils can make a dramatic influence in how well we fare through the tougher seasons. The study clearly shows the OUTGRO programme creates positive soil responses with increased availability of macro and micro nutrients, an increase of organic matter and the storage capacity of nutrients (CEC and BS), a balanced pH and an improvement in nutrient ratio.

What does this all mean on the farm? The increased nutrient and water efficiencies lead to the measured increase in pasture quality which has a direct relationship to on-farm production. The data is there to support the OUTGRO vision of "improving your farm productivity from the soil up."

^[1] MAF (2007). *Future Focus: Signposts to Success for New Zealand's Primary Industries*