

Healthy Soil Symposium with Dr. Christine Jones

Mackay, 26 November 2019

The following resources were provided by Dr. Christine Jones as a result of discussions held at Reef Catchments Healthy Soil Symposium.

Human Health

The [American Gut Project](#), involving the analysis of fecal samples from over 11,000 citizens, found people who consumed 30 or more different plant foods per week had more diverse gut microbiomes than people who consumed 10 or less. It was also discovered that the microbiome of individuals consuming grain-fed meat resembled the profiles of individuals on a course of antibiotics. (Hint: consume only grass-fed meat plus a wide diversity of plant foods).

[American Gut Project – The Worlds Largest Study of Gut Bacteria Reports Findings for 11,000 Participants](#)

Financial Health

Link to Darrin Qualman's net farm income data.

<http://www.darrinqualman.com/canadian-net-farm-income/> This article is interesting too

<http://www.darrinqualman.com/high-input-agriculture/>

We must get the green line (net farm income) back up near the blue line (gross farm revenue). We can if we restore soil health.

Soil Health

The [Soil Health Resource Guide](#) contains a list of 120 crop and pasture species. It's an American publication so not all varieties are available in Australia, but it might provide some inspiration for those having trouble coming up with a suitable multi-species mix. The 2019 Green Cover Seeds Soil Health Resource Guide also contains a range of articles on soil health, including a short article on 'Quorum Sensing in the Soil Microbiome' on p.29 and an article on 'Nitrogen: the Double-Edged Sword' on pages 30 and 31 (in the above link).

Quorum Sensing

You will find Bonnie Bassler's excellent TED talk on how bacteria communicate here

[Bonnie Bassler, 'How Bacteria Talk' - TED Talk on quorum sensing.](#)

[The Rhizosphere Harnessing phytomicrobiome signalling for rhizosphere microbiome engineering](#) - An excellent overview of some of the research into the multiple facets of phytomicrobiome signaling in the rhizosphere, including quorum sensing (QS) and quorum quenching (QQ). The rhizosphere can be 'engineered' using multi-species crops and pastures, bio stimulants and appropriate grazing management.

Dr. Christine Jones overview of the significance of microbial and plant diversity

[No-till on the Plains 2019 Christine Jones Community Tipping Points](#)

Plant Diversity

There's been increased interest in the power of plant diversity in recent years. The results from the **Jena Biodiversity Experiment in Germany**, for example, have been nothing short of stunning. The Jena folks put together a great little video, only 8.55 mins and is worth a look!

<https://www.youtube.com/watch?v=j3SvG2nBCTM>

In the Jena Experiment, plant diversity increased microbial diversity, resulting in increased soil carbon, which in turn improved soil health, increased productivity, enhanced the availability of nitrogen and phosphorus (and a whole heap of other plant nutrients) and improved soil water-holding capacity. These beneficial effects were additive - even up to 60 species in a mix. That is, every single kind of plant count - the more species you put together the better it gets.

The Jena experiment demonstrated that diverse mixes survive waterlogging far better than monocultures and are also more drought tolerant. In other words, diverse plant communities have higher resilience and greater stress tolerance than monocultures.

The kinds of plants used in the mix don't all have to be what you might consider high biomass. The research shows some sub-dominant species (such as linseed/flax) punch well above their weight in terms of stimulating the soil microbiome.

Livestock won't scour on a good quality multi-species forage. Further, if you include enough diversity you will not need to use fertiliser. Indeed, it is better NOT to use a high-analysis fertiliser. Results from around the world show investing in a diverse pasture mix produces higher returns than spending money on other inputs - and results in improved animal performance (higher growth rates, increased fertility, resistance to internal parasites etc).

Unfortunately increasing the diversity may also increase the cost. If you are unsure of the value of increased diversity, try putting a high diversity mix (say 24 species) down the center of a paddock with a lower diversity mix (say 8 species) either side. Observe where the animals graze and what happens to the soil under the more diverse mix, colour, structure, earthworm numbers etc.

Rhizophagy

Below are links to a couple of articles on rhizophagy (microbivory)

This is the easy-to-read version

<https://www.sciencedaily.com/releases/2018/09/180917111527.htm>

A PDF of the original article (not for the faint hearted) can be downloaded from

[10.3390/microorganisms6030095](https://doi.org/10.3390/microorganisms6030095)

Applying bio stimulants to seeds

Below is a link to a short video on the inexpensive method Ian and Dianne Haggerty use for applying bio stimulant to seed prior to planting.

https://www.youtube.com/watch?v=l_QGZ-zvY7I

Note that this video was filmed 10 years ago. When Ian mentioned 'compost tea' he was referring to a complicated brewed product with which they had ongoing issues. It was difficult to make and difficult to apply. Ian and Dianne now use vermiliquid and compost extract in place of compost tea.

Measuring Brix (using a refractometer)

<https://www.canadiancattlemen.ca/2009/10/19/whats-the-brix-level-on-that-pasture/>

See if you can find the typo in the above article (they say lower leaves in one spot where they mean upper). In addition to resulting in less than optimal animal production, low Brix can lead to a multitude of issues, including vulnerability to pests and diseases. American entomologist Tom Dykstra was one of the speakers at a recent conference I attended in Hungary. Here's his take on Brix

<https://www.ecofarmingdaily.com/grow-crops/picky-eater-insects-pass-on-high-brix-plants/>

The main thing with using a refractometer is to be consistent in your measurements (same part of the plant, same time of day). If you keep good records, you will start to see patterns and trends.

For those wanting to delve further into the role of secondary plant compounds (found in biochemically rich, high Brix plants) for both human and livestock health, I would recommend Professor Fred Provenza's recent book 'Nourishment'

Fred Provenza: Nourishment. Reflections on feeding body and spirit in a world of change

<https://www.amazon.com/Nourishment-Animals-Rediscovering-Nutritional-Wisdom/dp/1603588027>