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Department of Agricultural Sciences

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Office of Hon. Damien O'Connor
Minister of Agriculture
Private Bag 18041
Parliament Buildings
Wellington 6160

CC Simon Upton, Prof Juliete Gerrard, Andrew Morrison

Dear Minister O'Connor,

We wish to alert you to our concerns about the mythology of "Regenerative Agriculture" and its worrying increased profile in the NZ media and farming sectors. We believe it would be prudent for MPI to convene an expert panel of scientists to review the claims made about this system of farming. It is important that sound science drives our agricultural systems in much the same manner that science has informed our recent collective response to COVID 19.

We believe such a panel should provide a robust critique of the claims made about "Regenerative Agriculture" to ensure the public, industry and policy makers have a balanced and scientifically informed view of the ideas promulgated.

"Regenerative Agriculture" recently received highly favourable publicity from the Country Calendar programme aired on TV1 on Sunday 19 April and the associated article in the Christchurch Press on April 25. We recognize that both of these media outlets provide light entertainment for a largely urban audience. However, the lack of critical evaluation of the topics presented and opinions promoted are potentially damaging to the current world leading agricultural practices used by sheep and beef farmers in NZ. The underpinning scientific principles of our current agricultural systems are in danger of being devalued by a system that we believe has several serious short-comings. We have addressed some of these as a starting point in Attachment 1. We are particularly concerned that the erroneous publicity about "Regenerative Agriculture" will divert the limited NZ agricultural science resources from more important, substantive issues.

To define “Regenerative Agriculture” is difficult. There are imported text-book definitions, but in short it has become an all embracing term to encompass any individual’s practices who does not want to be seen to be using conventional agricultural techniques. Importantly, this lack of definition, by default, implies that current conventional agriculture, as practiced in NZ, is degenerative.

We strongly reject this implication. Our current sheep and beef farming practices are world leading. We recognize that there are practices and practitioners in conventional agriculture that can be improved but consider these are minor compared with most international production systems. Indeed the sheep and beef sector is the only industry to have reduced its greenhouse gas emissions intensity to below 1990s levels while continuing to achieve strong productivity gains[1]. For decades NZ scientists have advocated pastoral systems to NZ sheep and beef farmers that promote environmental stewardship within profitable and socially responsible farm systems.

In a similar wave of hype to “Regenerative agriculture”, “organic agriculture” has been promoted since the 1980s to provide an “alternative” production system for food. Due to flawed underlying principles, it’s promises have not been realized. In Europe where “organics” has been most strongly promoted, meta-analyses of production systems across a range of arable, horticultural and pastoral enterprises show an average 20% drop in production[2]. As a result only 6% of current European production is organic because businesses cannot make a profit from this lowered production and increased labour input, even with heavy financial subsidies[3]. This is why organic production has and will continue to be a cottage industry aimed at a local market in most countries.

The emergence of “Regenerative Agriculture” follows a similar path. It has arisen from unsustainable farming practices in Australia and North America. In those landscapes monocultures of cereals have degraded historic soil nitrogen and organic matter levels and therefore reduced nutrient supplies. Thus, the ability to regenerate soils with grazing livestock, and doing so with inputs of carbon from vegetation is appropriate. However, this does not mean the practice is required, relevant or useful in the context of NZ’s climates, soils and agricultural systems.

In Attachment 1 we have identified several dubious technical aspects on display in the Country Calendar programme and provided rebuttals to them. Dr Scott has detailed knowledge of Linnburn Station where it was filmed. He was employed as an agronomic consultant from 2010 to 2012. In this unique, extremely dry environment, the extensive agricultural system displayed does have some positive attributes. Of note, the system encourages the use of legumes that use nitrogen fixation to overcome the lack of nitrogen, which is the main limitation to all agricultural systems – as previously outlined to you by Prof Moot[4]. It also encourages high pasture cover at entry and exit of animals into a paddock (which enhances livestock performance) and the use of direct drilling. These are all sound scientifically based practices that are recommended to all farmers through appropriate extension. They are not new or unique to “Regenerative Agriculture” and, in fact, are well-established components of best practice in NZ’s conventional farming systems.

Our greater concerns relate to the extensive article in the Press. In Attachment 2 we have provided a brief precis of that article. A major omission in the list of principles given in relation to "Regenerative Agriculture" as promoted by Phyllis Tichinin, is the mention of a saleable product, which is fundamental to the NZ economy. The principles espoused appear to be a response to the valid negative connotations of the US feedlot based beef production systems, which are not relevant in NZ. As noted for organic producers, the number of consumers willing to pay a premium for such products is small domestically and internationally and NZ already has a strong affinity with them. They are supportive of our current conventional pasture based systems.

Interestingly Ms Tichinin states the "organics revolution never happened because the world continued to demand cheap and high yield agriculture". This is correct and there is no tangible sign that this position has changed. Indeed if the "green revolution" of agricultural production had not occurred in the 1970s, the world would currently need more than double the current land area it uses to feed 7.8 BN people[5]. These inconvenient truths tend to escape the well-fed consumers of developed countries.

In the Country Calendar programme pasture mixtures containing up to 40 species were promoted. This may be beneficial to our seed industry securing sales, but it is of no benefit to our farmers. Ecological principles show that to maintain diversity in pastures is virtually impossible as competition for light and nutrients causes extensive self-thinning. Our own research shows that no more than three functional groups (grass, legume, herb) make up over 90% of species regardless of the number sown. Equally, the encouragement of tall species defies basic physics principles. The taller a structure the more support it requires. In plants that support is provided by carbon as lignin, which strengthens the walls of woody tissue. This is herbage of low digestibility, slow to degrade in the environment and increases the need for additional nitrogen in the system for micro-organisms to break it down. Thus, the system advocated produces tall non digestible herbage. This is exactly what provided the fuel for both the Port Hills and Richmond fires. In summer dry climates this excessive tall dry herbage is a liability, and conventional farmers routinely use intensive grazing in early summer to remove that fire risk. Frequently, life-style blocks and the peri-urban environment have this tall poorly controlled vegetation, which increases the risk of fire, for example on the out skirts of Christchurch.

The Press article is constructed to trap the reader by weaving and repeating a series of data-free assumptions. Myths are then treated as facts which are further endorsed by influential people, so that finally the article becomes a self-fulfilling prophecy. Of concern is the reported acceptance of these ideas by the Primary Sector Council and the B+LNZ Board. Both organizations appear to lack the scientific expertise in their membership to critically evaluate the claims being made. There is a real danger that decades of research specific to NZ agriculture is being undermined by the uncritical importation of ill-founded, unscientific agricultural practices.

We suspect that MPI and industry organizations will be receiving a number of requests for funding of "Regenerative Agriculture" projects designed to validate these myths. We accept there is a strong lobby group behind this advocacy, in a similar manner to the organic community, the anti vax movement and anti 1080 lobby. However, we are convinced this system lacks credibility and contains many aspects that are

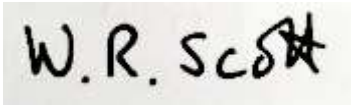
scientifically untenable. We believe it is our statutory duty as academics to provide some warning about the fallibility of these systems.

As indicated, we support several aspects of conventional agriculture that are promoted within Regenerative Agriculture. Practices such as rotational grazing, high quality leafy-legume based pastures, direct drilling, overcoming nutrient deficiencies, and landscape farming to provide ecosystem services. These all have a sound scientific basis. They are not new – they are already well researched and validated and are all worthy of demonstration and research. They are a major part of the agricultural systems we promote[6,7], and will continue to describe with quantitative evidence to agricultural classes at Lincoln University.

In conclusion, it is our scientific opinion that the promotion of "Regenerative Agriculture", as described in these two media items, is unsound because it fails many first principles of science. It is not supported by any evidence based on rigorous scrutiny.

We thank-you for your time in considering this matter. We welcome the opportunity to discuss these issues further and provide additional evidence if required, if that is of interest to you or your officials.

Kind Regards



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Attachment 1 Comments on Country Calendar Programme, Sunday April 19, 2020

Linnburn Station – Farming using Regenerative Agriculture

1. Fertilizer. The farmer Mr Barret stated "he hated synthetic chemical fertilizers and pesticides". We were then shown him mixing up a liquid fertilizer brew: the carrier was sea water because it contained "fungi and bacteria". This liquid fertilizer was sprayed on to a paddock through one single small nozzle. The application rate would be less than 50 litres/ha. This is appropriate for applying trace elements such as Molybdenum, but the amounts of essential macro elements such as Phosphorous and Sulphur is negligible. The farm is effectively mining the previously applied macro-nutrients. This is a common situation for many low input farms. It eventually leads to a nutrient deficiency, most frequently of P and S. This is the reason NZ agriculture applies superphosphate. Many controlled experiments with sea water and seaweed based products have shown zero or negative responses to these products. The most famous being the "Maxi-crop" case detailed by Dr Doug Edmeades. There have been numerous other liquid fertilizer based products that have been tested and failed to produce a significant response.

2. Direct drilling and cross-slot drill. The use of this drill is common practice on many conventional farms. It is routinely used to drill pastures and crops. Dr Scott has considerable experience with this technology. The cross-slot drill was designed by Dr John Baker from Massey University. The Baker Boot was designed to sow seed at normal sowing depth with fertilizer placed in a band below and to one side of the seed. There are two reasons for this separation and banding of the fertilizer. Firstly, acid fertilizer such as DAP is separated from the germinating seedling so it does not desiccate the seedling. Secondly, banding phosphatic fertilizer is more effective at making it readily available to plants rather than being fixed and less available, and therefore reduces the amount of fertilizer required. High P fixation is a particularly issue on volcanic areas of the North Island due to the presence of Allophane clay.

3. There is a need to minimize the level of existing vegetation prior to drilling. This is normally done by the application of glyphosate and a timely grazing both before and after glyphosate application. Excessive vegetation can cause blocked coulters and is probably the reason Linnburn has had to invest in an expensive crushing machine. This heavy piece of equipment over time will cause greater soil compaction. In the low rainfall environment of Linnburn the use of this machine is more appropriate than in many other areas of New Zealand where the climate and soil type limits their use.

4. In moist areas the live and dead vegetation can harbor slugs and/or springtails. Just a few days of damp weather during seed germination and emergence can be totally devastating. For this reason some farmers continue to use conventional cultivation, including ploughing, to prepare a seedbed. The risk of failure from these insects is lower in the low rainfall environment of the Maniototo district, where direct drilling is encouraged by most agricultural consultants to preserve soil moisture.

5. To overcome the pest issue the cross-slot drill has a slugbait pellet distributor that can be installed on the rear. Unfortunately green vegetation being flattened before the use of the drill, as shown in the programme, would increase the humidity in the seedling rhizosphere and increase the survival and activity of slugs and springtails. With no pesticide applied this example was a graphic demonstration of "worst practice" direct drilling. It may be successful in this dry environment but would fail in wetter regions.

6. Equally, springtails are not controlled by slugbait but thrive under the same high humidity conditions. Post-emergence checking for their presence is normal practice with a spray required if numbers exceed an economic threshold.

7. Biased Sampling. The effects of "Regenerative Agriculture" were supposedly demonstrated by the increased earthworm populations. This was graphically shown by a wet soil having earth worms being compared with a dry soil. It is relatively easy to find these sorts of differences between irrigated paddocks and dry fence-lines as appeared to be shown in this example.

8. Linnburn also has a forage cropping programme and centre pivot irrigators. These provide opportunities to grow consistently high yielding winterfeed crops which are vital for the severe Maniototo winters. Winter feed crops did not appear to be part of the regenerative programme. To understand a farm system, its social, environmental and financial viability takes longer than is available in a 22 minute programme. It is therefore important that the highlights of such a programme are not mis-interpreted as presenting positive transformational change. To do so in a farm situation takes an extended period of time – and, in contrast to this regenerative programme, has been quantitatively demonstrated in peer reviewed publications for similar farms in dry environments using legumes in a conventional farm system[6].

Attachment 2

Regenerative Agriculture- Precis of ChCh Press article: John McCrone "Roots 'n' all". The Press, Saturday, April 25, 2020 pB1 and B3. Also distributed nationwide by *Stuff online.*

Why sunflowers and lentils herald New Zealand's regenerative revolution. So why are policy makers suddenly getting interested in Regenerative Agriculture? Peter Barrett, former campervan entrepreneur and now manager of Central Otago's 9300ha Linnburn Station, has had neighbouring farmers looking askance.

At the Regenerative Farming conference at Lincoln University, Barrett stands chest out, jaw jutting, gruff and combative. A kiwi going his own way.

Barrett says his philosophy is just to throw a bit of everything edible at his fields and discover what will grow lushly in the harsh climate of the Maniototo Plains." You just put a pinch of everything in the ground and then nature will define what grows. Feed the dirt with variety and design your farm system around that". Barrett says yes, the regenerative agriculture thing is the farming revolution New Zealand has been waiting for.

It is pretty evangelical stuff. Much like a hard core of fed up farmers were urging the country to go organic in the 1900's….

Last year Agricultural Minister Damien O'Connor set up the Primary Sector Council to figure out the long term direction for farming. Its report in December "Fit for a better world" broadly endorsed the regenerative approach.

After years of no policy at last we had someone come out with an actual vision to get behind. Just as significantly industry bodies like Beef and Lamb are clambering aboard too.

Phyllis Tichinin, a Californian nutritionist……."the organic revolution never happened because the world continued to demand cheap and high yield agriculture. However, Regenerative Farming will be a response to two new market drivers in particular- health and climate change."

Tichinin promoted the principles of regenerative agriculture as follows;

1. Minimise soil disturbance
2. Maximise biodiversity
3. Keep the earth armoured
4. Add animals

The article then described other potential marketing issues of agricultural products …. Within a decade NZ agriculture could be caught between an ethics driven collapse in animal protein demand and a stampede of overseas farmers all rushing to go planet friendly and organic.

Finally the article reminded us the Corona virus had arrived "So sheep among the sunflowers might still become the new season look".