

# **Submission to the Senate Education, Employment and Workplace Relations References committee. (final draft)**

**re: the steady decline in enrollments thus graduates in Agricultural Science.**

## **Historical background to Australian agricultural production.**

When Australia was first settled there were widespread areas of fertile soil. These areas were then selected for crop and livestock production. With reference to those areas that were cropped, the quality and yield of wheat for example was high. Yields were consistently high even by today's standards. The quality by today's standards was very high. The average protein levels were often around 16-18%. These levels have rarely been achieved since that time.

These soils were cropped for many years with similar yields being obtained. The primary source of soil cultivation was by means of animals eg horses.

It is my experience and expectation that if a soil test had have been taken of these soils in their original state that a current day soil scientist would conclude that the soil had insufficient nutrients to support a viable crop.

With the advent of modern machinery such as tractors farmers were able to cultivate the soil more often. Larger areas were able to be cropped at the same time. Soils structure declined and did soil organic matter (soil carbon). There was a corresponding decline in soil nutrients

Gradually yields started to decline, but tractors got bigger and so on till we have what we have today, degraded soils that often cannot support viable crops without the input of fertilisers. Whilst the addition of fertiliser may have restored production levels, or even increased them in the short term it is generally accepted that they did little to address the decline in soil health.

A similar process occurred in our once very fertile grazing lands. As sheep numbers dramatically increased graziers often and regularly overgrazed their pastures. A succession of rabbit plagues compounded this problem. With overgrazing pastures cannot recover and the root system declines. This in turn caused a decline in soil organic matter and soil structure. As with our cropping soils there was a corresponding decline in soil nutrients.

## **New techniques to restore grazing landscapes**

Fortunately we now have the knowledge and tools at our disposal to repair and regenerate our grazing lands and soils. The tool has a number of terms and variants, including, Cell Grazing, Rotational grazing, Block grazing, etc. Essentially these processes require a different philosophy and approach to pasture management.

They are all based on a biological understanding of plant ecology.

Large paddocks are divided into much smaller ones and more water points are installed. Large numbers of livestock are the moved from one paddock to the next at specific times, generally with a short duration.

This process allows virtually all the vegetation to be consumed and then an opportunity for the regrowth of grass shoots. The root system penetrates deeper into the soil. With this program undesirable pasture species generally disappear and more beneficial species re establish themselves.

This biological process restores soil structure and carbon content. There is less erosion as the soil can drain better, but also hold water for longer. These soils are better equipped to withstand drier periods. The overall result is much better pastures and therefore higher carrying capacity. These factors improve farm productivity and economic outcomes.

It is interesting to note that all these beneficial outcomes are not usually accompanied by the addition of any fertiliser and often without a soil test. They are the result of a new understanding, philosophy and approach to agriculture based on biology.

There is no expectation or evidence that these gains are temporary though they are expected to reach a production plateau at some stage. There is no evidence that these results are largely constrained by soil nutrient availability.

### **Established teaching businesses**

There is now a proliferation of Australian businesses teaching this philosophy and the associated techniques.

Some practitioners include:

RCS <http://www.rcs.au.com/about/ourpeople/index.htm>

Grazing Best Practice <http://www.grazingbestprac.com.au/home.html>

Holistic Management <http://holisticmanagement.org/>

Some of these businesses attract Government subsidies for primary producers.

Perhaps the most knowledgeable person in Australia and Internationally is Dr. Christine Jones, a former CSIRO scientist. Her work in understanding this process in terms of soil biology is profound. She describes this restorative process as Pulse Grazing, implying that the process pumps carbon back into soils. <http://www.amazingcarbon.com/>

Another well know Australian scientist who understands, supports and promotes this type of work is Tim Flannery. In fact Tim is on the record as saying that he has seen a property in the N. Territory that increased production by 700%. <http://www.insideoutsidemgt.com.au/TimFlanneryfull.mp3>

It can reasonably be concluded that livestock managers now days have access and the ability to restore degraded grazing landscapes. These practices also increase soil carbon, farm productivity, production and economic outcomes.

## **Transferring this technology**

Given the support and uptake of these techniques and the demonstrated benefits it would seem a logical progression therefore to adapt and transfer these methods to other forms of agricultural production where animal grazing is not conducted.

This is the area I have focused on for the past 25 years. I firmly believe that my research in this area can duplicate the benefits achieved using grazing. I have investigated methods for crops such as sugarcane, broadacre crops, vegetables, orcharding, bananas, cotton, etc.

Instead of using livestock, mowing equipment is used. In an orchard an obvious method is to focus on the interrows (pasture) by implementing a very accurate and diligent mowing regime. The preferred mower is a light weight front deck mower as opposed to a tractor and slasher. A front deck mower can get much closer to the trees and causes far less compaction. With this regime herbicide areas near the trees can be reduced and pasture can then colonise this newly available territory.

As the pasture improves more nutrients are made available, soil structure improves as does the soil carbon content. This newly created soil fertility feeds the trees. Fertiliser rates can be decreased. I believe (and have sufficient evidence) that in many instances in a period of no more than 2 years all fertiliser input can be eliminated.

For sugarcane and broadacre cropping etc wide area cutting equipment is used on a covercrop. The purpose of this treatment is to regenerate soil fertility in as little as 5 months by mimicking the beneficial effects of a pasture break. For this reason the species of covercrop plants includes annual legumes and annual graingrasses.

The covercrop is allowed to reach a height of approx. 400 mm and is cut down approx. 200mm. This procedure is repeated 1 or 2 more times. There is a huge amount of green manure created. However it is the dynamic recycling and regeneration of the root system with its associated biology that creates the most positive soil health benefits. This process is further explained in the accompanying document: Towards Sustainable Sugarcane.

This treatment can be used as a soil regenerative tool for many diverse forms of agriculture.

## **Resistance and blockages to change**

Since 1997 I have repeatedly contacted, sent documents, held discussions, meetings etc with relevant Officers of many Institutions. These include: Sugar Research Development Corp., BSES (Sugar research), Grains Research Development Corp. State DPIs, numerous Universities, State and Federal Ministers of Agriculture and Science. and the CSIRO.

On each occasion there has been a reluctance to properly investigate my submissions, infact on many occasions these Officers are not even able to understand my work. Their responses range from me being delusional, from a different planet, lacking common sense and, I'll prove it to you by doing a soil test.

As far as I am concerned these people/officers have an inability to think, or at least think about anything they have not been taught, or teach.

They almost invariably see agricultural production as only being possible with external inputs of artificial fertiliser. They do not accept that there could be other ways to base production, such as biological methods.

It is interesting to note that the CSIRO does not even endorse Rotational Grazing. In discussions with senior officers including Dr. Brian Keating their opinion is that the evidence and research conducted by CSIRO is at best, inconclusive.

As long as this situation remains, with decisions on how research funding is to be allocated being controlled by persons with entrenched, often dogmatic views, the future of agriculture, and that of teaching institutions is mostly described as, bleak.

At this time there is no interest and no intent to even consider how to understand these biological systems let alone transfer the technology and benefits to other forms of agriculture.

### **Perception of Agriculture.**

The Public's perception, and therefore potential enrollments in agricultural science, is that agriculture is essentially a dirty business. People believe, rightly or wrongly that the industry is a net polluter and generally degrades the environment. The reality, and therefore the perception is that agriculture is reliant on nasty chemicals and toxic fertilisers. There is some acceptance and interest however in organic agriculture.

The majority of people think that overall agriculture is a degenerative activity.

This is half right and half wrong. The statements by Tim Flannery indicate that agriculture, ie livestock grazing can actually be a regenerative process (when it utilises the principles of Rotational Grazing). Further that this form of agriculture can save us from dangerous climate change by sequestering CO<sub>2</sub>.

### **Impact of enrollments**

Given the above it should come as no surprise that there has been a steady decline in enrollments in agricultural science.

With the current focus on a chemical view of agriculture and production, people, or potential students, who have not done well, or who are not well suited to the sciences of mathematics, chemistry and physics, are excluded from being able to pursue a career in agriculture.

Until there is a radical transformation of how we interpret agriculture this situation can be expected to remain. This will of course suit the established and entrenched practitioners and beneficiaries at our Universities and other Institutions.

Their solution: more money.

## What to teach

I am quite sure that there is a legitimate role for the traditional sciences of maths, physics and chemistry in agricultural science, however I firmly believe that there is an over reliance on them.

Their position of importance seems well in excess of what they deserve. The current curriculum places great importance on these technical matters such that people (such as myself) with alternative ideas are viewed as uneducated and irrelevant. The same exclusion and discrimination occurs to other practitioners such as successful biological farmers.

- (1) I strongly recommend that there be a re evaluation of the curriculum.
- (2) I recommend that the study of biology have an equal allocation of time and importance.
- (3) I recommend that students who are not well suited to maths, physics and chemistry be given an opportunity to complete a recognised study course.
- (4) I recommend that the practice and effect of Pulse grazing as described by Dr. Christine Jones be mandatory in any curriculum.
- (5) I recommend that the practice and effect of Cell, Rotational, Block and Rational Grazing as practiced by the grazing and dairying industries be mandatory in any curriculum.
- (6) I recommend that Teachers and students establish an ongoing relationship with recognised successful agriculturalists who are using the mentioned techniques.
- (7) I recommend that teaching be a hands on experience where students actually conduct research where they manage covercrops and pastures using the techniques discussed.
- (8) I recommend that the document I have attached: Original p=sam (an abstract that I presented at the International Union of Soil Science Congress in 2006 Philadelphia) be given consideration as to forming part of the basis for teaching agricultural science.

