

# Diversity is the answer to our environmental issues

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# Healthy Rivers Proposed PC1

- This plan change needs to be developed in collaboration with all areas that impact on the environment. We, as a nation are caretakers of Aotearoa.

# Diversity in our Ecosystems

- We have all the answers for healthy farming practices that improve our environment
- Human, animal and soil health are intrinsically linked. Healthy soil management and diverse pastures underpin this.
- Ecosystem – is a community of living organisms in conjunction with the non –living components of their environment, interacting as a system. These biotic and abiotic components are linked together through nutrient cycles and energy flows
- An understanding of nature is necessary to see how the environmental problems we have are a result of faulty management processes of the land and animals.
- Livestock on our steeper country aren't the problem but are actually part of the solution

# Light Farming

- Photosynthesis is the process that removes CO<sub>2</sub> from the atmosphere, replaces it with life giving oxygen, supports a robust soil microbiome, regenerates topsoil, enhances the nutrient density of food, restores water balance to the landscape and increases the profitability of agriculture.
- The simple sugars produced in photosynthesis are the building blocks for life in and on earth.
- Carbon in the soil is a sponge (for water and nutrients) and diverse pastures grow this carbon sponge
- 95 % of life on earth resides in the soil and most of the energy is derived from plant carbon

# Carbon and microbial activity

- Exchange between microbes and plants - carbon for minerals and trace elements.
- Networks of beneficial fungi – transport system
- Microbial activity drives the process of soil aggregation - enhancing soil STRUCTURAL STABILITY, AERATION, INFILTRATION & WATER HOLDING CAPACITY
- Unfortunately Many of todays farming methods have severely compromised soil microbial communities significantly reducing the amount of liquid carbon transferred to and stabilised in soil – resulting in erosion, loss of topsoil, drought intolerance, loss of nutrients to waterways
- Soil dysfunction impacts on human and animal health also – with the loss of nutrients available to plant vegetable and meat

# The Soil Carbon Sink

- The functioning of the soil ecosystem is determined by the presence, diversity and rate of actively growing green plants – as well as the presence or absence of chemical toxins (most plant dependent microbes are negatively impacted by the use of “icides”)
- A highly effective carbon cycle is part of nature
- Soil can function as a carbon source adding carbon to the atmosphere or a carbon sink – removing CO<sub>2</sub> from the atmosphere.
- The health of the soil and the vitality of the plants, animals and people depends on the effective functioning of this cycle.
- Solution - Management processes that increase stable levels of soil carbon. When levels of soil carbon increase so too, do the levels of organic nitrogen and the ability of soil to infiltrate and store water
- Carbon is needed along with microbial secretions for the formation of water stable aggregates that enhance soil structure, which in turn, REDUCE RUNOFF AND MINIMISE EROSION

# Key principals to improve soil health (and thus environmental) sustainability

- 1 Plant diversity to increase diversity in soil
- 2 Manage soils by disturbing them less
- 3 Green is good and year long green is even better- feed the soil
- 4 Microbes matter
- 5 Limit chemical use
- 6 Animal Integration



# C1 diffuse discharge management

The 4 contaminants

- Nitrogen
- Phosphorus
- E coli
- Sediment



# Nitrogen management

- Needs to be tailored to the individual farm
- Overseer was not designed as a regulatory tool . Mathematical models only take into account the physical data components that have been entered. Models cant predict nature and biological interactions that occur at the level of the soil or within a rumen based on the nutrient density of forage.
- Farm leachate measuring
- Soil health, pasture nutrient density and rumen microbial function all determine how much N is being lost to the environment. N levels in ruminant urine is dependent on the amount of true protein and level of carbohydrate in the ruminant feed.
- Visual soil assessment and pasture nutrient density (easily measured as brix using refractometer) are means of determining healthy soil to assess level of N excretion in cattle urine.
- Level of milking cow N excretion can be determined from Milk urea nitrogen which is directly linked to Blood urea nitrogen . Dairy companies in New Zealand are measuring this parameter on a daily basis
- Use of biologically friendly fertilisers and lime to increase nutrient density in forage so there is less N lost to environment
- Consideration needs to be afforded to new technologies

# Phosphorus

- Phosphorus mostly lost to waterways in association with soil particles.
- Prevent erosion by increasing soil carbon and diverse pastures to increase capacity for water storage and soil stability

# Pathogens – E coli as an indicator

- Healthy soil is a natural soil bio filter.
- Degraded low diversity land and soils tend to harbour more “opportunistic” bacteria while healthy biodiverse ecosystems favour more stable and specialist bacteria.
- Water pathogen levels need to be assessed for lakes also. We know what E coli level entering but not what levels leaving lakes.
- A number of water sampling sites used for preparation of PC1 had no E coli data.
- Identification of individual host sources is a prerequisite to formulation of remediation plans. DNA typing. Some rivers and Lakes (eg lake Waikare) are a significant habitat of waterfowl.

# Sediment

- Erosion is the main cause. Most widespread erosion is mass movement soil slips – widespread in New Zealand on slopes greater than 15 degrees. This is an observational study (Basher et al) Slips are rainfall initiated and most extensive in soft rock hill country (East coast, inland Whanganui, Taranaki & Manawatu. The slope is not the problem. It is the lack of soil structure – which can be rectified.
- Lack of carbon and soil biology mostly due to historic use of acid fertilisers and monoculture pastures.
- Pinetrees are not the answer. Logging creates mass sediment discharge from steep land and loss of soil nutrients.
- Koi carp are a major problem in waterways and lakes of the North Waikato. Destruction of riverbanks and lake edges and bottom. Groups in my community are working on the harvesting of this resource. Use of Koi to make fertiliser that stimulates soil biology is a win-win situation. Presently restricted by council regulations.

## C2 Slope

- Not proven by science that removing cattle from slopes of greater than 15 degrees is going to decrease erosion . Observation studies indicate that rainfall is associated with slips of soft rock hill country in NZ
- Need animals involved in maintaining healthy soils. Cattle not the problem – they can be part of the solution
- Diverse pastures and bio friendly fertilisers, especially lime will increase carbon and soil biology and stabilise the land from rainfall induced slips.

**It can be done sustainably !!**



# Stock Exclusion from waterways

- Whilst desirable it is not practical to fence waterbodies on steep hill country and it is cost prohibitive
- Not proven that excluding cattle by fencing on non – intensive steep hill country will result in improved water quality

# Farm Environment Plan

- Subcatchment information should be used to decide if farms are likely to have contaminant discharges
- Level for acceptable phosphate, nitrate, pathogen and sediment to be established and applied at individual farm levels. Leachate testing (ideally) , soil assessment, pasture diversity are reviewed at individual farm level.
- Individual farm environment plans to be produced if problem with contaminants in subcatchment level.
- FEP developed (if required) with farmer ownership
- Incentives for farmers to follow biologically friendly fertiliser application
- Have input from qualified people in area of biological farming/regenerative agriculture in establishing FEP



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- Farming profitably within environmental limits. Dr Christine Jones
- Light Farming : Restoring carbon, organic nitrogen and biodiversity. Dr Christine Jones

# Conclusion

- We need to get this right !
- Policy needs to be linked to unambiguous national policy around water quality. Other players in this field need to do their part also. Point source discharges, roading and bank erosion, river level fluctuations and erosion in relation to the use of Waikato river for electricity generation (river edge eco systems)
- We are guardians of the land we inhabitant . It is up to all new Zealanders to treat the land and its resources in a sustainable manner.

**This is my Turangawaewae. Thank You**

