

ENVIRONMENT MANAGEMENT CHALLENGES FACING SOUTH ISLAND FARMERS

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The farmland from which we produce can be categorized into classes by, firstly, slope (flat, or capable of cultivation or conservation tillage, or oversowable); secondly, soil moisture holding capacity; thirdly, rainfall and/or irrigation; and fourthly, drainage environment. We can then think about management challenges on the land from the perspective of:

1. Soil
2. Water
3. Land cover and associated systems
4. Animal and/or crop utilization
5. Biodiversity
6. Greenhouse gases

It took modern man over 200 years to identify the problems associated with point source pollution, and while we have the solutions, they are yet to be fully implemented. We have really only identified diffuse pollution as an issue in the past 20 years, and my take on science, innovation and management skills, is that, with the exception of Greenhouse gases, we are well advanced towards solutions.

Much of the focus (research, innovation, and publicity, good & bad, centered in the South Island has been on east coast and central irrigation. Ironically, solutions are easier on much of that land, partly due to ability to control inputs and mitigations and partly to a relatively young infrastructure.

Relatively flat, potentially irrigated predominately low SMC soils

The three key challenges are:

1. Nitrogen losses
2. Biodiversity
3. Greenhouse gases

Figure 1. Forages for reduced nitrate loss

*Plantain
(multi pathway)*



*Beet
(low-N feed)*



*Legume-dominated
pastures*



*Beef on chicory
(deep-rooting herbs)*



*Forage cereal to soak up
winter deposited urine*



Deep-rooting pastures



Figure 2. Biodiversity



Figure 3. Water storage



Solutions for nitrogen losses are moving fast – examples include:

1. EM mapping
2. Precision soil testing
3. Soil moisture sensors
4. Low rate water application
5. Precision water application
6. Forages for reduced nitrates via multiple mechanisms
7. Animal diet management
8. Off paddock feeding systems
9. Manage aquifer recharge and water storage

Greenhouse gases – where are we looking?

On farm

1. Diet management where practical
2. “in shed” intervention for dairy
3. Animal genetics
4. The urine patch – a replacement for DCD!
5. Waste water treatment (e.g. “Cleartech”)
6. Energy savings such as pressurised water

Off farm

1. Alternatives to coal that have enough energy intensity for boilers
2. Electrification options for transport
3. Reduction in water use
4. Opportunities in the circular economy

More intensively farmed, non flat South Island areas

The two key issues are first – sensitive receiving environments (groundwater, rivers, lakes) typically challenged by drainage systems and secondly, slope. The predominant issues in those environments will be:

1. Phosphorous loss
2. Sediment loss
3. E Coli movement
4. Fertility transfer
5. Greenhouse gas mitigation

Figure 4. Heavy soils on slopes



Solutions for soil and nutrient movement include:

1. Smart fencing (permanent and virtual)
2. Agile grazing management
3. Retirement of selected areas
4. Deep rooted pastures
5. Intervention in water flows, including sediment traps, biofilters, natural filters
6. Conservation tillage and establishment options
7. Non pasture biomass
8. Precision soil testing
9. Precision fertilizer placement

“High country” environments with low stock intensity, variable rates of slope (flat to very steep), variable rainfall

Major challenges are from introduced animal and plant species. The priorities are:

1. Control of introduced pests (mammalian)
2. Control of introduced plants (pine, broom, rosehip, hieracium etc.)
3. Prevention of wind erosion

Figure 5. High Country environments

Balancing flats and hills



Above-ground biomass



Pest control



Dryland deep-rooting pastures to prevent wind erosion



Deer control of briar rose



Selected irrigation to protect fragile dryland



Solutions require integrated systems management, but include variations around:

1. New forms of pest control
2. Elimination of seed bases for wilding trees
3. Mixed animal species
4. Oversowing
5. Selective irrigation to take pressure off fragile environments
6. Precision soil testing to enable targeted application
7. Smart fencing systems

Conclusions

1. The challenges are varied
2. The solutions are varied
3. We can not have “one size fits all” policies and assumptions
4. In many cases, the solutions are either capital intensive or increase cost structures, so sustainable solutions require associated profitability to be able to afford to implement systems that meet societal expectations