

Achieving Perennial Pasture

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A lot of us are achieving less than desirable pasture longevity. The variable results suggest that we are doing something wrong and could modify what we do.

Poor pasture longevity may be related to a number of things:

- It could be related to over grazing of very palatable new cultivars which contain animal friendly endophytes.
- It may be that we are not treating the new pastures as a crop. We don't graze to the appropriate residual level and then move the stock out, we allow continued grazing.
- It may be plant breeding, but I doubt it. I have seen the same grasses that pull in the Waikato are impossible to pull out in Canterbury.
- Perhaps it is the endophytes are not performing as expected – not a well matched symbiosis, or perhaps dead in the bag.
- Perhaps it is related to what we do to our soils. Ballance Agri-Nutrients investigated this in 2008 with what came to be called “the big dig”. 10,000 soil cores were taken from 100 paddocks. It was very clear that the paddocks with the most problems were those that had been aggressively cultivated. Those that had NOT been cultivated were performing well. In these paddocks the pest/predator balance was intact, as was the soil structure – the “natural capital” that we pay so much for!

So let's investigate what we do and what could be done.

Establishment

Need to recognise the value of natural capital

- Soil structure takes time to develop, let's protect it. It is easier to damage, to pug after cultivation.
- Soil organic matter (OM). Cultivation removes this. As soil OM reduces, soil moisture holding capacity is reduced, soil CEC sites decrease and less nutrient retention occurs.
- Soil organisms. More than 2.5 billion per gram of soil. Predators keep plant pest populations under control. Remove predators and pest populations increase resulting in pasture loss. Take for example the impact of removing NZ grass grub predators with power harrows, this results in an explosion of grass grub numbers 3-4 years after the cultivation date (the big dig data). What you do in the paddock determines the population of pests in the paddock – AgResearch.
- Soil fertility. Cultivation results in soil mineralisation leading to the release of nutrients. Cultivation (ploughing) also buries soil fertility.
- On light soils cultivation can result in formation of concretions (hard layers) at around 2-4 cm depth. These present no problem to root development when wet, however as they dry over the first summer they can become a significant barrier to rooting depth.

Need to develop cropping programs that control perennial weeds

- One application of Roundup herbicide (glyphosate) in spring will not control perennial weed species. These weeds will re-infest the new pasture within 1-2 years. To control perennial species at least one, ideally two, Roundup applications in the autumn season are required.
- As the plant moves from spring growth to autumn growth more carbohydrate (sap flow) is partitioned to the roots, taking Roundup with it and controlling the weed.
- Key weeds in question would be Californian thistle, couch, kikuyu, paspalum, browntop, mercer grass, Indian doab, creeping mallow etc.

Need to understand that microscopic eelworms (nematodes) that attack clover seedlings should be controlled prior to sowing clover seed

- Clover root knot and clover cyst nematodes prevent successful establishment of new clovers from sown seed. The only acceptable way to control them is to build a “period of time without clover” into cropping / regrassing programs. With no clover present, populations of organisms that only feed on clover decline allowing for easy establishment of newly sown clovers.
- Sowing depth is important. Often clovers are sown in the same slot as ryegrass where interplant competition is immense, with clovers generally losing.
- Once nematodes and clover root weevil populations have been reduced because of a period of time with NO clover, new clover seed can establish by broadcasting on the surface.

The cost of using treated seed is worth it

- Without seed treatments two key pests in the upper North Island can decimate your efforts. Treated seed effectively gives up to six weeks’ protection against and control of Argentine stem weevil and African black beetle.
- After this time the (correctly selected) endophyte has become active to protect from further damage.



Figure 1. Black beetle damage on left hand side where bare seed was used.

Crops and new grass CAN BE established without cultivation...

- It is not simply a case of spray and drill – this is high risk!
- Care is required to understand and address the weeds and pests that exist.
- Perennial weeds require multiple autumn sprays.
- With spring sowing slugs should be assumed, requiring use of slugbait. Slugbait is also required after a wet summer.
- With autumn sowing black beetle presence should be assumed, requiring treated seed.
- Equipment selection is important.
- Drills are required that can handle the plant residue and accurately place the seed.
- Drills are required that can broadcast slugbait and/or clover seed in the same pass.
- Without cultivation “natural capital” is left unaffected and there is almost no nutrient release due to mineralisation. So, most importantly, drills are required that can place the nitrogen and phosphorus containing DAP fertiliser near the seed, to make up for the lack of mineralisation.

DAP placement

- Whether tilling the soil or not, placement of DAP near the germinating seed will enhance establishment.
- Phosphate is not very mobile in the soil. It moves by diffusion, only 5% gets into the plant by the route common to most other nutrients – mass flow.
- Phosphate is essential for early seedling root development.
- Phosphate placed on the surface is not available if the seed is below the surface – it needs rainfall and time to become available.



Figure 2. Effect of drilling DAP with (grass to grass) Italian ryegrass.

Seeding rate is important

- With annual ryegrass a high seeding rate means more tillers through the winter, meaning higher production (within reason), knowing that the annual ryegrass will be sprayed out prior to summer.
- With perennial pastures however a high seeding rate (as well as costing more) will likely smother clover seedlings (especially if those clover seedlings have been sown at the same depth and in the same row as the ryegrass) and create a large amount of inter-plant competition.
- It should be noted that in a 4-5 year dairy pasture, ryegrass plant numbers represent a seed rate of around 1.0 kg seed/ha. I am *not* recommending you sow at this rate!
- However, high seed rates mean inter-plant competition is high for both moisture and nutrients as the new perennial pasture progresses through spring into summer. This leads to a large mortality of seedlings over the first summer. A small number of the biggest plants survive, hopefully the clover also.

Process of growing crops and new pasture without tillage

- First, begin by planning early.
- Soil test to identify lime or capital fertiliser requirements.
- Apply these **after** the first Roundup spray.
- Plan a program that includes at least two autumn sprays and a period of time without clover.
- This may mean starting with a summer fallow, as Doug Avery did in Marlborough to establish his lucerne. The summer fallow of two Roundup sprays (the first in January) controls perennial weeds and “stops the pump” – dead plants do not transpire water. Soil moisture is maintained allowing for the selection of a drilling date for a winter ryegrass crop, likely in early March after a second spray.
- Graze 3-4 days after the first spray.
- This process further allows for the rotting of weed rhizomes and stolons making no-till crop establishment in the spring easier.
- Drill treated seed, and use DAP to enhance establishment – remember without cultivation there will be very little soil mineralisation hence very little release of nutrients (N and P) into soil solution. DAP at 150 kg/ha in 130-150mm rows makes up for this.
- In the spring spray the annual ryegrass. This can be done 3-4 days prior to grazing or 5-14 days prior to harvesting as silage.
- Removing the annual rye as silage has the added benefit that a lot of slugs are also removed, and the ground is left free of cow pats, making drilling a nicer job.
- Whether direct drilling maize, brassicas or chicory in the spring always use slug bait. Underestimate slugs at your peril.
- Always drill with Cropzeal Boron Boost if direct drilling brassicas or fodder beet to make up for the lack of soil mineralisation and to evenly distribute the trace element boron.



Figure 3. Drilling DAP with turnips established with no-tillage. LHS: No DAP; RHS: 100 kg DAP/ha.

- Pest control is important. Springtails and cutworm can destroy both cultivated and no-tilled crops. There are insecticides that should be applied with the final Roundup spray to control these. However, follow-up monitoring and subsequent sprays should be carried out if required.
- Manage pests as per a cultivated crop. Note that the weed spectrum in a no-tilled crop will be different to that in a cultivated crop. Grass weeds predominate with no-till. All weeds are present with cultivation. Different herbicides may need to be used.
- Apply capital crop fertiliser and side dressings of nitrogen as you would with a cultivated crop.

After harvesting the crop, direct drill the paddock into perennial pasture

- The timing of this will be dependent on other issues. For example, is spring sown pasture (after a swede or fodder beet crop) usually successful? If not, perhaps a summer chicory crop could be sown to supply high quality summer feed and to mop up excess nitrogen prior to sowing perennial pasture.
- Because there has been a period of time with NO clover, clover pest populations should be low, hence clover seed could be broadcast on the surface.
- Ryegrass should be drilled with DAP (150 kg DAP/ha), with treated seed, without cultivating the soil.
- Manage the new perennial pasture closely for at least the first 12 months to ensure clover is NOT smothered. Apply around 200 kg nitrogen/ha in the first 12 months. It takes 8-18 months for sown clover to contribute significantly to N supply.

New pastures will grow more dry matter than old pastures and are likely to be more palatable

- Increased palatability means that there will be increased grazing pressure, potentially resulting in lower post-grazing residuals. This is not a problem if it occurs once, but if it occurs every grazing eventually plants will weaken and die out.

- If the new pasture produces more dry matter than the pasture it replaces, unless it receives more fertiliser nutrients to keep it productive, it will slowly decline to the productivity level of the existing old pastures.

Selection of endophyte in perennial ryegrass and tall fescue pasture is an important decision

- Endophyte fungi form a symbiotic relationship with the host plant to protect it against insects.
- They infect the crown, seed head and lower leaf blades, preventing pests such as black beetle and Argentine stem weevil from damaging the plant.
- A warning: Some endophytes are NOT suitable for use in the black beetle zone. AR1 for example does not control black beetle, and the pasture may be completely lost over the first 3-4 years. Some endophytes are weaker than others at controlling Argentine stem weevil.
- If the seed has not been stored in a coolstore over the summer, there is a high likelihood that the live endophyte population in the seed will be very low. Sowing this seed will result in pasture failure over 3-4 years.

What can we change?

- Start valuing the natural capital you have.
- Stop aggressive cultivation. Transition to no-tillage crop and pasture establishment. Not only will this protect your natural capital (soil structure, organic matter content and soil predators), and prevent formation of concretions, rill erosion and reduce potential for pugging, but less sediment is likely to be lost, meaning less phosphate is washed from the farm to contaminate waterways.
- Manage new pastures to prevent over grazing.
- Use the wonderful array of tools at your disposal:
 - Treated seed.
 - Drill with DAP.
 - Multiple autumn sprays to control perennial weeds.
 - Period of time with no clover to control clover pests.
 - Adopt summer fallows.