

# Summer salads for hill country cattle

## Summer-safe multi-species cattle pasture

**Why:** To evaluate the performance of a variety of diverse summer seed mixes against a monoculture single graze crop, with the aim of developing more resilient forage crops that provide high-quality feed economically with lower inputs.

**Where:** An 0.07 ha plot study and two case study paddocks on a beef finishing property at Te Pahu in the Waikato.

**Who:** Phil Weir (AgFirst), Katherine Tozer (AgResearch), Tracy Dale (AgResearch), Angus Peterson (Farmlands), Hamish Johnston (Agricom) and John Foley (PGGW Seeds).

### What:

- Simple mixtures provided a viable alternative to a brassica monoculture based on energy yield and energy costs. The most promising option was a simple rape-dominant mixture, which contained rape, plantain and a cereal (see **Table 1**). It had a high energy yield, low weed abundance and a low metabolisable energy cost.
- Hyper-diverse mixtures did not provide energy yield or energy cost advantages when compared to a simple mixture.
- Plantain contributed little to total dry matter in mid-summer, but provided forage at the end of February for a second grazing.
- The cereal established rapidly and reduced weed ingress in the rape-dominant mixture harvested in mid-summer.
- A diverse mix may have lower weed ingress, but herbicide options are also limited.

**Read more:** *Summer-safe multi-species cattle pasture:* [ourlandandwater.nz/RPF2022](https://ourlandandwater.nz/RPF2022)

As climate variability increases, farmers need resilient summer forage crops. With pasture quality falling during mid- and late-summer this project explored mixed-species, single-graze forage crops that can fill the feed gap.

Phil Weir is a busy man. Along with running a family dry-stock farm in the Waikato he is also a farming advisor with Agfirst and has recently completed a Nuffield Scholarship.

With a changing climate that is becoming more variable, and seeing warmer and drier summers with droughts becoming more common in northern Waikato and Northland, Phil sees a need to move farm systems away from using supplements over these drier months as they will only increase in the future.

“Every time you turn on your tractor to feed out, in a dry-stock context, you’re losing money,” he says.

His operation grows dairy and dairy-beef calves year-round. Summers have become tough as pasture quality suffers in the dry and the heat.

“Summers are hard for all animals, but particularly on calves,” he says. “Trying to increase their weight from 100 kg to 200 kg over the first summer can be difficult.

“All the options available for feeding in summer create an imbalance in your workload. You’re losing your repair and maintenance time or having to take on casual staff. Ideally we’re looking for an in situ crop instead,” he says.

Phil sometimes grows a monoculture crop like kale for his animals. He hopes that adding multiple species of plants that grow well in the area would result in less pest pressure, less weed burden, less spraying and more dry matter. Less tractor use would also see lower emissions.



**Phil Weir and Katherine Tozer assess multi-species options to support hill country dry-stock farmers to fill summer feed gaps**

Phil believes that with more calves likely to be coming onto the market due to Fonterra signalling changes with bobby calves, there needs to be a way of making it easier. This is what prompted him to get involved with AgResearch scientists Katherine Tozer and Tracy Dale to find summer-safe multi-species mixes for summer forage crops as part of a Rural Professional Fund project funded by Our Land and Water, with trialling carried out on his farm.

### The trial process

The study was narrow – focusing on the agronomics of the various mixes. This range of simple four-species mixtures along with a couple of hyper-diverse mixtures containing over 10 species were compared with a brassica monoculture.

The most diverse mixture included 21 species: rape, oats, plantain, red clover, cocksfoot, prairie grass, chicory, tall fescue, meadow fescue, sulla, sunflower, perennial ryegrass, hybrid ryegrass, lupin, lucerne, timothy, strawberry clover, crimson clover, balansa clover, white clover and vetch. The 11-species mixture included: rape, plantain, red clover, chicory, buckwheat, phacelia, pea, crimson clover, white clover, vetch and Triticale kudus.

Rape (a brassica) was the monoculture crop and was also used in the simpler mixes, along with a cereal (oats), plantain for ground cover and red clover.

Preparation for the trial involved spraying off the site with a mixture of both a non-selective herbicide and insecticide, with fertiliser applied a week later. Discing, power harrowing and rolling followed.

In mid-October, multiple plots of about 20 sqm were established. Seeds were drilled in at a depth of 1 cm with a width of 1.5 m and row spacing of 15 cm.

There were multiple plots, including a monoculture plot of rape, oats, plantain and red clover. Others had each of the species dominating a mix at a ratio of 61% by weight and 13% for each of the rest, another had equal amounts of the seed. As there were concerns some of the seed could be buried too deeply this wasn't rolled. Diammonium phosphate was hand broadcast and an application made of Slugout.

The seed bed on the two paddock-scale case studies, which were about 1.3 ha in size, was prepared the same way as the smaller plots. A Kuhn Triple disc drill was used to sow seed in the paddocks. The first paddock was rape-dominant with the second the 11-species mix.

Sprays to control broadleaf weeds and insects were used in November with the monoculture rape crop sprayed for white butterfly in January.

It became clear things weren't going quite to plan when the red clover seed had a very low germination



**Table 1: Herbage production, metabolisable energy content, energy yield and energy cost for three mixtures in the small plot study, and the two case study paddocks, on a dry-stock farm in Waikato. SED: standard error of difference**

Treatment	Herbage production kg DM/ha	Metabolisable energy MJ/kg DM	Energy yield MJ ME/ha	Energy cost (\$/100 MJ ME)
<b>Small plot study</b>				
Rape monoculture	10,860	11	119,780	0.99
Rape-dominant mix	13,350	8	106,720	1.16
11 species mix	9,470	8.3	78,200	1.31
SED	999	0.27	10,820	
Significance level	P<0.01	P<0.01	P<0.05	
<b>Case study paddocks</b>				
Rape-dominant mix	13,250	10.8	143,070	0.86
11 species mix	8,530	8.4	71,660	1.43

rate – less than 25% compared to well over 70% for the other seeds, and 97% in the case of oats. This saw the four-seed mixes become three-seed mixes. This would normally be picked up through emergence testing of the seed in a glasshouse prior to the trial getting underway. But Covid-19 restrictions stymied this step, with testing taking place at the same time as the start of the trial.

While there was more rain than usual during spring, which got the plants up and running, a dry summer followed. This may have been behind the plantain failing to thrive over the heat of summer, only coming into its own in late February for a second grazing.

Before the crops were ready for grazing in mid-January, samples were taken to determine how much dry matter was produced across each of the plots and what that meant for metabolisable energy. This saw plant matter cut to ground level, weighed, shredded and dried.

### Challenges, costs and benefits

Many of the species in the 21 species mix didn't perform well.

“A lot of the species established, but then died and contributed little to the overall yield,” says Katherine. “There was also a high proportion of yield from sunflowers. but they're poor in terms of feed value.”

While the 21-species mix had reasonable dry matter and metabolisable energy, sunflowers can be a bit 'hit and miss' with cattle. “While cattle will eat the leaves, they will sometimes avoid sunflower stalks if there is other feed available,” she says. The stems make up a big portion of the sunflowers' dry matter.

Adjustments for this saw the mix slide in energy value as a consequence.

“The cost of producing metabolisable energy with the 21 species mix was more expensive than the rape monoculture because the cost of the seed is so expensive. Even with no weed or pest control, it was still more expensive because of the seed costs,” Katherine says.

Oats in mixes proved to be very effective at suppressing weeds, even at low sowing rates. But oats fell down in a big way by going to seed well ahead of the rest of the forage crop. By the time the stock were put on in mid-January it was in very poor condition.

### Recommendations

Both Phil and Katherine recommend Triticale should be looked at as the cereal in the mix in the future. It might not be as aggressive at suppressing weeds, but its seedhead timing fits better.

By the end of the trial the most promising option was a simple rape-dominant mixture that contained rape, plantain and a cereal. It had a high energy yield, low weed abundance and a low cost per unit of metabolisable energy.

Katherine emphasises that while the results are interesting, this was one summer trial on one farm. More research on more farms over several years is needed, she says.

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*Delwyn Dickey for the Our Land and Water National Science Challenge*