

Future Forage Systems Project

Annual Legumes Hub Notes Te Mahanga, 9th October 2012



Balansa clover - photo taken 24th August 2012

Future Forage Systems - Background

The East Coast Future Forage Systems Project provides the opportunity to road-test a range of forage technologies such as lucerne, plantain and annual clovers – both as crops and on hill country. Where possible, this will consist of on-farm demonstrations where new options are benchmarked against existing farm practice. Once we understand how these alternatives perform locally, we can look at integrating them into farming systems.

The focus at Te Mahunga is to evaluate the role of alternative forages in more profitable and flexible dryland farming systems

Annual clovers at Te Mahanga

Data from the East Coast of the South Island (CloverMax FITT Trial) suggests that Persian clover can produce 8 Tonne by the end of August from a March sowing – i.e. an average pasture growth rate of 50 kg/ha/day through autumn and winter. Such a crop should then also fix around 200 kg N/ha – available for any subsequent grass/crop planting. Based on these figures it seemed sensible to evaluate the use of annual clovers as a crop. To do this we need to understand management and production and how they might fit within a farming system.

Establishment

The trial was established in a 5 ha paddock on 28 and 29 March 2012. Soil test showed Olsen P levels of 40, Potassium of 7, Sulphate Sulphur of 17 and a pH of 5.7. Prior to cultivation, 150 kg DAP was applied. The area was initially disced and then sown with a ‘one pass’ rotary cultivator/air drill. Six annual clovers (Table 1) were established in double drill rows (370 metres long). The seed was inadvertently sown too deep (as per perennial ryegrass) with the rotary cultivator and the area was re-sown using a Duncan drill to broadcast on the surface. Since the Duncan drill was narrower, it was possible to see that deeper drilling had a dramatic effect, with around 80% less seedlings resulting from the deeper drilling. Soil conditions at sowing were moderately wet, resulting in considerable compaction.

Germination and initial establishment were generally very slow, with Persian and Balansa clovers having the best establishment (Table 2). Seedlings appeared vulnerable to paradise ducks, slugs and clover root weevil and the trial was treated with chlorpyrifos (1.2 litres/ha) plus Mesurol on the 24th April.

Table 1. Sowing rates and drill types

Clover spp	% Germ	Sowing rate kg/ha	Amazone FRS1 (4.4 m)	Duncan 720 (3.65 m)
			Actual sowing rate kg/ha	Actual sowing rate Kg/ha
Sub – Denmark	85	5	6	6.0
Sub – Woogenellup	85	5	6	4.8
Balansa – Bolta	85	5	6	5.5
Arrowleaf – Arrowtas	73	5	6.8	5.8
Arrowleaf - Cefalu	85	5	6	5.6
Persian	85	10	12	9.0
Persian	85	5	6	5.0

Table 2. Establishment success (18 May)

Clover spp	Vigour score	Establishment success
Sub – Denmark	3	2
Sub – Woogenellup	4	2
Balansa – Bolta	6	9
Arrowleaf – Arrowtas	3	4
Arrowleaf - Cefalu	5	3
Persian (10 kg/ha)	7	10
Persian (5 kg/ha)	8	9

Volunteer brassica, perennial ryegrass, poa annua, and broadleaf weeds (principally speedwell and chickweed) all compromised establishment in the early stages. This was especially the case in the slower establishing Arrowleaf and sub clover cultivars. Data from Australia showed that different annual clovers and cultivars were sensitive to different broad leaf weed herbicides and since no NZ data was available, we did our own testing at Poukawa (see section on Persian clover). This showed that Pulsar followed by Select were the best bets. However, cold weather limited the use of Pulsar at Te Mahanga so Select was used at 3 litres across the trial.

Both broadleaf weeds and grasses needed to be controlled and given our lack of knowledge in this area we decided to test several spraying strategies. An area of the trial was left totally unsprayed (Control - Fig 2). Another area had Select applied to control broadleaf weeds. Two further areas had Select applied for broadleaf weeds and either Gallant or Arrow applied to control grass weeds. Select (3 litres in 200 litres H₂O/ha) was applied on the 2nd June and Gallant Ultra (250 ml plus 1 litres Uptake/ha) and Arrow (750 ml plus 1 litre Uptake/ha) on the 20th July.

By 11 July, the effect of broadleaf weed spraying was noticeable between sprayed and unsprayed areas (Plate 1). Select set back the growth of Persian clover by almost two thirds. Bolta Balansa was slightly less affected than Persian, Cefalu least affected whilst Arrowleaf clover growth was dismal in both sprayed and unsprayed.

The control of grass weeds with Gallant and Arrow resulted in rapid growth of all the clovers. However, this also coincided with warmer weather. Ground conditions were extremely wet during July and August and the observation was that the poor drainage had compromised the Arrowleaf and Subterraneum clovers.

Figure 1. Weed control plan at Te Mahanga

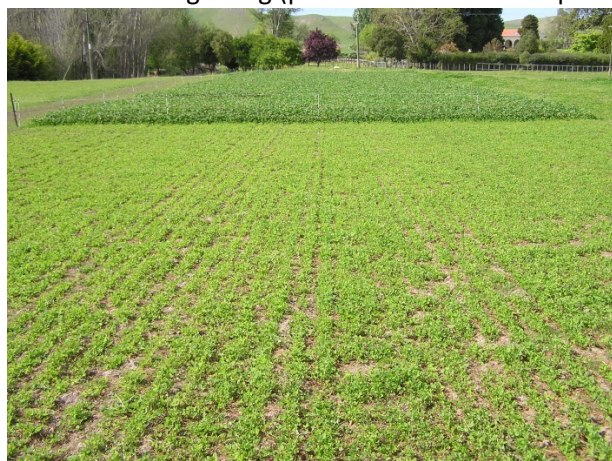
Gate	West
	Control
	Broad leaf weed control Select No grass weed control
	Broad leaf control Select Grass weed control Gallant Ultra
	Broad leaf control Select Grass weed control
	East

Plate 1. Weed control (background) showing adverse effects of Select on Persian clover



In mid-August, areas of the paddock were fenced off and the block was hard grazed with lambs. The Persian clover scored best in terms of grazing recovery (see Plate 2).

Plate 2. Recovery of Persian clover after grazing (photo taken 5th late September 2012).



Production

The growth of Persian and Balansa was outstanding through August. On the 24th August, Persian and Balansa clovers were cut to assess dry matter production – these were the only clovers worth cutting at this time. Persian clover produced 2817 kg DM/ha when sown at 10 kg/ha and Persian clover produced 1542 kg DM/ha when sown at 5 kg/ha. Balansa clover produced 1561 kg DM/ha – from observation, almost all of this would have been grown during August. By the 25th September, Balansa had produced 5014 kg DM/ha whereas the Persian clover (sown at 10 kg DM/ha) had produced 3358 kg DM/ha.

Persian clovers at Poukawa

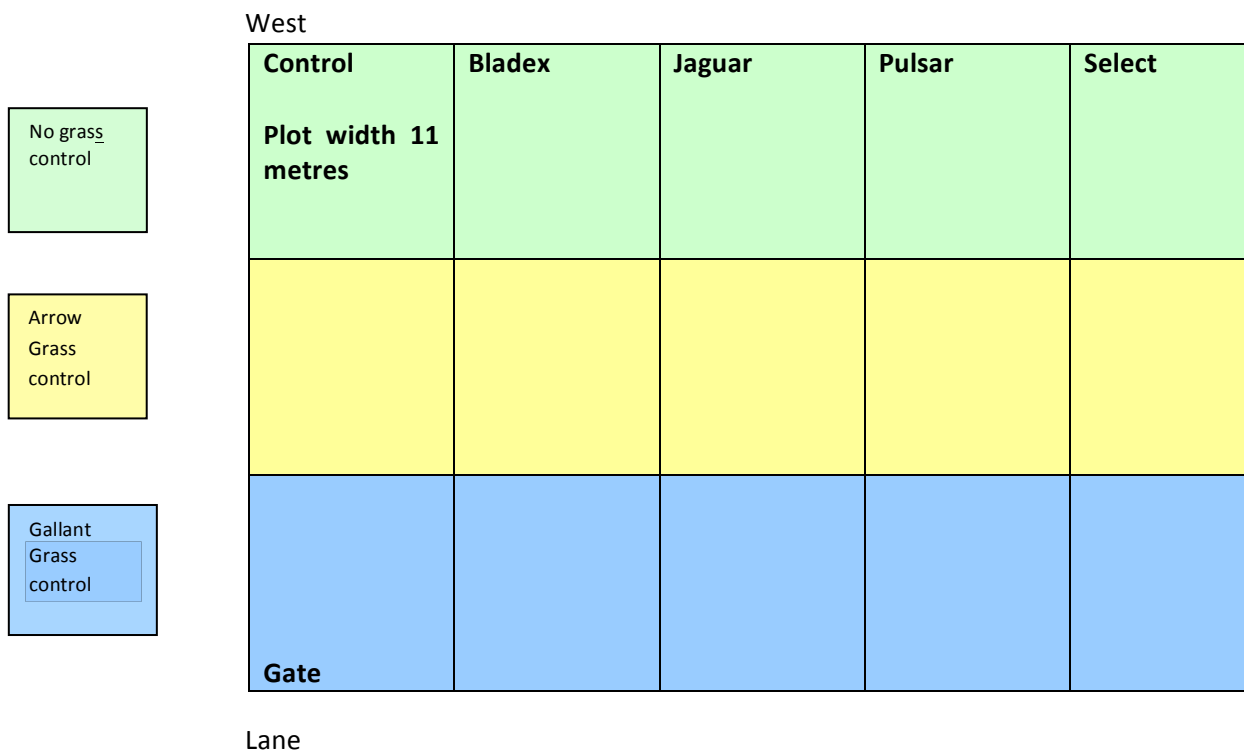
A second demonstration site was set up at Poukawa comparing winter dry matter production and animal performance (ewes and lambs) on Persian clover with that of Moata sown at the same time. Persian clover should fix significant nitrogen so the intention is to follow this study on into 2013 and compare the production of pastures re-sown in perennial ryegrass following Persian clover or annual ryegrass.

Establishment

The trial was established in six 1.5 ha paddocks on the 29 March 2012. The paddocks were previously in annual ryegrass and had been sprayed with Roundup. Soil test showed Olsen P levels of 31 and pH levels of 5.7. Prior to cultivation, 150 kg DAP was applied. The area was initially disced and then sown with a 'one pass' rotary cultivator/air drill. Three paddocks were sown in Persian clover @ 5kg/ha and 3 paddocks were sown in Moata @ 25 kg/ha.

Establishment was slow and weeds (speedwell, chickweed, stinging nettle and storksbill) were problematic. Grass weeds were prolific. Weed control solutions were sought from within NZ and Australia. However, advice re broadleaf weed control was not compelling or positive and we undertook our own testing. On the 8th May, four herbicides were used for broadleaf weed control in each paddock (Bladex, Jaguar, Select and Pulsar and along with a control strip of no herbicide). On the 2nd June, grass weeds were controlled with Arrow and Gallant. Once again, a control strip was left in each paddock (Fig 2).

Figure 2. Spray plan (3 replicates in total)



Paddocks were scored 22 days after spraying for broadleaf weeds (30th May) and again on the 18th July (Table 3). There was a marked negative effect of Jaguar on Persian clover. Plant leaves were burnt and there was an obvious loss of plants. For the other herbicides, the damage showed mainly as twisted and deformed leaves.

Table 3. Effect of herbicide on Persian clover

Herbicide	Damage score* (30 th May)	Damage score* (18 th July)	Clover height (18 th July)
Control	0	0	160
Bladex	4	5	87
Jaguar	8	9.7	30
Pulsar	1	1	170
Select	3	2.3	140

*Score of 10 = most damage

In the control plots where there was no grass control, clover content was suppressed and unsprayed areas had only 23% of the clover that was present within sprayed areas. Both Gallant and Arrow controlled grass weeds effectively and had no apparent impact on the Persian clover.

Persian clover has developed a leaf rust or scorch (probably *Kabatiella caulivora*). Grazing has certainly reduced this problem.

Production

Annual ryegrass pastures were grazed as necessary and pasture growth rates measured using exclusion cages. By the end of August, annual ryegrasses had been grazed three times and had produced 3545 kg DM/ha while Persian clover remained un-grazed and had produced 3000 kg DM/ha. From our visual assessments of covers at the start of August, it is likely that Persian clover was growing at 60-70 kg DM/ha/day during August. Further cuts were made on the 2nd October, indicating the annual ryegrass had produced an additional 1200 kg DM/ha whereas the Persian clover had produced an additional 860 kg DM/ha. These cuts on the Persian clover were made on an un-grazed area so production was probably limited by the mass of feed already present.

From early September, late lambing ewes and their lambs were allocated to both blocks soon after lambing and rotationally grazed. Lambs were mostly multiples, with ewes on annual ryegrass rearing 178% lambs and ewes on Persian clover rearing 175% lambs. The intention was that ewes and lambs would not be limited for feed in order to determine what potential growth rates were on each forage. Over a 27 day period to the 5th October, lambs on clover grew at 394 g/d and lambs on annual ryegrass grew at 321 g/d. Lamb growth rates will continue to be monitored through until weaning.

In hindsight we should have been grazing Persian clover much earlier. It appears to respond well to grazing and we would probably have generated much greater yields as a result.

What have we learnt to date?

- Choose crop to suit site and drainage. All annual clovers like warm dry sites but Persian and Balansa seem to be more forgiving than the others. Arrowleaf in particular does not like it wet.
- Seedbed preparation is critical and seed should be sown shallow or broadcast followed by a light chain harrow. Aim for a sowing rate of 10 kg/ha rather than 5 kg/ha
- Seedlings vulnerable to pests and slugs – monitor.
- Young plants are highly sensitive to weeds – particularly to grass weeds which will eventually suppress the crop. Control volunteer grasses at clover 3-5 leaf stage. Then tackle broadleaf weeds. Early spraying will enable Pulsar to be used whilst it is still warm. Persian and Balansa are more vigorous and may well out-compete broadleaf weeds. The most cost effective herbicide for broadleaf weed control in Persian clover is Pulsar (\$62/ha) followed by Select (\$46/ha). Select was reasonably kind on Arrowleaf, Balansa and Sub clover. Gallant Ultra (\$86/ha) or Arrow (\$77/ha) were equally effective in controlling grass weeds.
- Persian and Balansa grow extremely rapidly during in August and may be a way of providing very high quality feed in early spring.
- Light grazing should commence once the crop achieves 15 cm in height. Persian clover appears to respond well to defoliation.