Choice of forage crops for winter feed

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Take home messages

- **the choice of vigorous, leafy, nutritious forage crops available for low to medium rainfall environments to supply nutritious green feed to sheep during the winter and spring months continues to expand**
- **forage cereal crops provide feed during winter; vetch is useful from late winter into spring and forage brassicas provide from late spring into summer**
- **to help decide which forage to grow from the broad range available, first plan the time of greatest need (time of year, duration), intention to harvest silage, hay or grain and the rotational requirements of the paddock in which forage is to be planted**

Background

Higher prices for meat and fibre in recent years have driven a resurgence of interest in livestock. A livestock enterprise in the farm business acts as a risk management tool for leaner years and works at the same time as a lower risk, profitable enterprise in its own right.

Livestock production is no longer a case of just accepting what is turned off the paddock. Healthy ewes, increased numbers of lambs weaned and faster growth rates drive production and overall profitability. Meeting nutritional requirements according to age, pregnancy or lactation throughout the year is imperative if optimal production is to be reached. Achieving this only with regenerating pastures and stubbles is difficult; hand feeding grain or hay is necessary in most seasons and with higher stocking rates. Alternatively, sown forage crops may be used to fill the gaps.

Aim

To evaluate different commercially available forage crop varieties for their feed value and capacity to recover during winter and spring in a low rainfall Mallee-Wimmera environment.

Method

Location:	Corack
Replicates:	4
Sowing date:	29 April 2011
Seeding density:	outlined in table 1.
Crop type/s:	outlined in table 1.
Fertiliser:	Granulock® (11:22:0:4, 4% Zn) @ 50 kg/ha

A replicated plot trial evaluating forage wheat, barley and oat varieties, oaten hay varieties, vetch and vetch/oat mixes and a forage brassica was established in barley stubble at Corack in the southern Mallee. Variety details are given in Table 1, treatments listed in Tables 3 and 4. Some varieties are usually recommended for higher rainfall areas, but were included to assess early forage production given the large soil moisture reserve available after exceptional summer rainfall: 186mm in January and 79mm in February.

Table 1. Crop variety, use, maturity traits and sowing rates in Forage Crop trial, Corack 2011

Crop	Variety	Use	Maturity	Sowing Rate (kg/ha)
Barley	Hindmarsh	feed grain	very early	80
	Moby	forage	early	80
	Moby – half SR*			40
	Dictator	forage	early-mid	60
	White Stallion	forage	early	100
Triticale	Tuckerbox	forage	mid	80
	Crackerjack	forage	late	60
Wheat	Wrangler	forage	mid	80
Oats	Tammar	hay/feed grain	late	80
	Kangaroo	hay/feed grain	mid-late	80
	Winteroo	forage/hay/feed grain	early-mid	80
	Outback	forage	mid-late	80
	Galileo	forage/hay	late	60
	Mulgara	hay/feed grain	early-mid	80
	Brusher	forage/hay/feed grain	early-mid	80
Oat/Vetch Mix	Rasina/Winteroo	*See individual variety descriptions*		40/20
	Morava/Winteroo		40/20	
Vetch	Morava	forage/hay	late	45
	Rasina	forage/hay	early	45
Forage brassica	Winfred	grazing	early	3

*Variety details and recommended sowing rates obtained from NVT and seed merchant documents. *SR – sowing rate*

Dry matter production (DM) was measured when crops were at least 20cm high. A cut (First Graze) was taken for cereal varieties and oat/vetch mix on 19 July and a regrowth cut on these areas taken on 29 September. The First Graze and regrowth cuts were totalled to measure the cumulative grazing value (Two Grazes). A separate fresh cut (Later Winter Graze) was taken from these plots on 22 August to measure forage value if it had been allowed to grow for another month before its first graze.

Similar cuts for pure vetch and forage brassica were each taken one month later (when they too had reached 20cm high); 'First Graze' on 19 August, the regrowth cut for 'Two Grazes' on 26 October and 'Later Winter Graze' on 20 September.

Tissue samples were collected at the time of 'First Graze' and bulked for each crop type for feed testing.

The crops remaining in plots (uncut areas) were grown through to harvest. Dry matter was measured at anthesis to measure total ungrazed dry matter production, also equivalent to hay yield.

Grain yield of cereals and vetch was measured using a small plot harvester (barley 18 November, oats and oats/vetch 24 November, wheat 2 December).

Results

Despite the wet start to the season, the period after sowing became quite dry. After 18mm of rain fell on 20 May, rainfall remained at Decile 2 until timely rain fell between the second week of August and early October which recovered dry matter and grain production.

At the first time of sampling (First Graze July: cereals, August: vetch and forage brassica), the nutritional value of all the forages met the minimum requirements for production (ie. lactating ewes and lambs); although digestibility (DOMD) of vetch was adequate for maintenance (55%) but borderline for production. The vetch and forage brassica were both well within safe limits for nitrate levels (Table 2).

Table 2. Nutritional value of forage cereals, vetch and forage brassica when 20cm high, Corack 2011

Crop	Crude protein (% of DM)	Neutral Detergent Fibre (% of DM)	Metabolisable Energy (Calculated) (MJ/kg DM)	Digestibility (DOMD) (Calculated) (% of DM)	Nitrate (mg/kg of DM)
Barley	25.7	41.9	12.9	78.1	-
Triticale	26.7	40.7	12.9	78.1	-
Wheat	27.4	40.3	13.1	79.5	-
Oats	25.1	39.3	12.9	78.1	-
Oats/Vetch mix	26.3	36.9	13.0	78.9	-
Vetch	32.6	38.7	11.6	72.0	1400
Forage Brassica	29.6	24.4	13.3	80.2	2900
Min. req. for lactating ewes and lambs	*> 16 %*	*> 30 %*	*> 11 MJ kg/DM >*	*75 %*	*> 4-5000 mg/kg is toxic*

The production of the forage crops at different grazing times are presented in Table 3.

Brusher, Mulgara and Galileo oats as well as White Stallion barley had all produced at least 350 kg DM/ha by mid July, seven weeks after sowing. These varieties were closely followed by Tuckerbox triticale, Moby barley, Outback and Winteroo oats exceeding 300 kg DM/ha, with Dictator barley and Kangaroo oats not far behind.

A delay of one month before grazing, Later Winter Graze, enabled many varieties to produce over 1000 kg DM/ha in a similar order, again with Brusher oats as the outstanding variety.

The Two Grazes treatment measured the crop's ability to recover from grazing and once again produce forage. White Stallion and Moby barley, Mulgara oats and Tuckerbox triticale had combined grazing values of over 3100 kg DM/ha. Brusher oats, Moby barley at half sowing rate and Hindmarsh barley all produced over 2850 kg DM/ha. This was 800-1000 kg DM/ha more than some varieties such as Winteroo, Outback and Galileo oats which had performed well early.

Moby barley sown at half the recommended sowing rate performed very well in the low rainfall environment, producing as much dry matter and grain as the fully-sown-rate crop.

'The Two Grazes' grazing value of the oat/vetch mixes Rasina/Winteroo and Morava/Winteroo, produced over 2400 kg DM/ha. The oats dominated these forage mixes: production was largely a reflection of Winteroo performance. However, the vetch still had a presence which would hold rotation value with the legume break crop benefits. Nearby Rasina and Morava crops were producing as much forage without the oats.

The Rasina and Morava vetch and Winfred forage brassica had similar production levels to the forage cereals, but production was occurring one month later compared with the forage cereals, shifting the feed curve to later in the season.

Table 3. Forage value of forage cereals, vetch and Brassica, Corack 2011

Crop	Variety	Maturity	First Graze* (kg/ha)	Later Winter Graze** (kg/ha)	Two Grazes (cumulative value) *** (kg/ha)
Barley	Hindmarsh	very early	217^{f}	914^{def}	2884^{bcde}
	Moby	early	334^{abcde}	1099^{bcd}	3439^{ab}
	Moby – half SR		267^{cdef}	968^{cdef}	2938^{bcd}
	Dictator	early-mid	294^{abcdef}	798^{f}	2767^{bcdef}
	White Stallion	early	364^{ab}	1031^{bcde}	3822^{a}
Triticale	Tuckerbox	mid	335^{abcde}	967^{cdef}	3112^{abcd}
	Crackerjack	late	279^{bcdef}	809^{ef}	2688^{cdef}
Wheat	Wrangler	mid	274^{bcdef}	430^{g}	2146^{f}
Oats	Tammar	late	263^{ef}	829^{ef}	2537^{def}
	Kangaroo	mid-late	294^{abcdef}	1202^{ab}	2689^{cdef}
	Winteroo	early-mid	305^{abcfdef}	1209^{ab}	2187^{ef}
	Outback	mid-late	306^{abcdef}	999^{bcdef}	2140^{f}
	Galileo	late	351^{abcd}	1091^{bcd}	2115^{f}
	Mulgara	early-mid	354^{abc}	1186^{abc}	3310^{abc}
	Brusher	early-mid	382^{a}	1340^{a}	2907^{bcde}
Oat/Vetch Mix	Rasina/Winteroo	*See individual variety descriptions*	255^{ef}	1169^{abc}	2676^{cdef}
	Morava/Winteroo		324^{abcde}	1118^{abcd}	2468^{def}
		Sig. diff.	**P=0.046**	**P<0.001**	**P<0.001**
		LSD (P=<0.05)	**91**	**229**	**721**
		CV%	**21**	**15.9**	**18.4**
#Vetch	Morava	late	703	2130	2623
	Rasina	early	737	1669	3063
#Forage brassica	Winfred	early	1469	3314	2180

Not included in analysis as samples were taken in different months to cereals.

* *First graze: cereals (19 July) vetch & forage brassica (19 August)*

** *Late winter graze: cereals (22 August) vetch & forage brassica (20 September)*

*** *Two grazes: cereals (19 July & 26 September); vetch & forage brassica (19 August & 26 October).*

Hay value (measured as dry matter at anthesis on ungrazed plots) and grain yield for ungrazed forage crops are presented in Table 4. Note that not all varieties are recommended for hay (see Table 1). Where not recommended for hay, they have been included to demonstrate their dry matter production capability. Grain yield has been presented to indicate grain harvest if you were keeping an area excluded from grazing for seed production. For this reason, yields are not discussed.

Of the hay types, Galileo, Kangaroo, and Winteroo oats produced over 6600 kg DM/ha at anthesis. Moby barley and Outback oats are not recommended for hay, but at anthesis had produced over 6000 kg DM/ha, indicating their usefulness as silage options had they been cut earlier.

Winfred forage brassica was still green when all the other crops had matured.

Table 4. Anthesis dry matter production (hay) and grain yield of ungrazed forage cereals, vetch and forage brassica, Corack 2011

Crop	Variety	Maturity	Ungrazed anthesis (t/ha)	Ungrazed DM grain yield (t/ha)
Barley	Hindmarsh	very early	5685^{bcde}	3.23^{bc}
	Moby	early	6142^{abcd}	2.21^{i}
	Moby – half SR		6155^{abcd}	2.06^{i}
	Dictator	early-mid	4992^{ef}	1.98^{ij}
	White Stallion	early	5777b^{cde}	2.06^{ij}
Triticale	Tuckerbox	mid	5581^{bcde}	2.93^{def}
	Crackerjack	late	5976^{bcde}	2.81^{d}
Wheat	Wrangler	mid	5864a^{bcde}	3.11^{ef}
Oats	Tammar	late	5129^{cdef}	3.06^{cde}
	Kangaroo	mid-late	6631^{ab}	2.98^{cdef}
	Winteroo	early-mid	6234^{abc}	3.05^{cde}
	Outback	mid-late	6626^{ab}	3.16^{cd}
	Galileo	late	7075^{a}	2.73^{fg}
	Mulgara	early-mid	4081f	2.51^{gh}
	Brusher	early-mid	5189^{cdef}	2.24^{hi}
Oat/Vetch Mix	Rasina/Winteroo	*See individual variety descriptions*	5735^{bcde}	na
	Morava/Winteroo		5735^{bcde}	na
Vetch	Morava	late	5343^{cde}	1.85^{j}
Forage brassica	Rasina	early	5019^{def}	1.87^{j}
	Winfred	early	5735^{bcde}	na
		Sig. diff.	**P<0.001**	**P<0.001**
		LSD (P=<0.05)	**1139**	**0.28**
		CV%	**14**	**7.4**

na – not applicable as they would not be harvested for grain.

Interpretation

Despite the decile two rainfall conditions experienced during winter, the stored soil moisture from summer and the return of regular rain from August onwards enabled crops to produce lush stands of growth and yield well in 2011.

Crops had different growth rates as the season progressed, varying the forage available at different times of the year. Only a couple of varieties performed below the others: probably as a result of inadequate rainfall or because the grazing timing of the treatment did not match recommended grazing management, eg. grazed after first node (GS30).

In 2011, Moby and White Stallion barley, Tuckerbox triticale and Kangaroo, Winteroo, Outback, Mulgara and Brusher oats, were the crops that produced the most feed in July and August. Most of these are early- to mid-maturing varieties. Varieties Moby and White Stallion barley, Tuckerbox triticale, Mulgara and Brusher Oats and Hindmarsh barley responded best to grazing, creating the most total dry matter in two grazes. Moby barley sown at half rate performed quite well compared with the full sowing rate.

Hay production was highest for suitable hay varieties Kangaroo, Winteroo and Galileo oats.

Pure vetch stands produced over 5 t/ha of hay; while lower than some other cereal crops, the benefits of the high quality hay, cereal rotation break and nitrogen fixation for the following cereal crop would drive the decision to choose a lower producing crop. To bolster early feed production, the addition of oats helped increase forage available.

Commercial practice: what this means for the farmer

- many forage crops that can produce fast growing, winter feed to support production of lactating ewes and growing lambs are now available. End use options of these crops range from forage, silage and hay, to grain production.
- to help decide which forage might be grown from the broad range available, farmers should take into consideration when the feed is needed (time of year, duration), whether the crop will be harvested for silage, hay or grain, and the rotational needs of the paddock
- in general, early- to mid- maturing barley and oat varieties were the top performers of winter feed production in 2011, appearing best suited to the low-medium rainfall Mallee and Wimmera.
- experiment first with a smaller paddock which can be stocked adequately to graze the paddock evenly. This prevents animals grazing the same areas where they keep the regrowth fresh and sweet, while other areas remain ungrazed and risk growing tall and rank
- use of electric fencing to create smaller areas and intensify stocking rate is a very good way of managing grazing in larger paddocks, as has been experienced by several growers in the nearby Nullawil Best Wool Best Lamb group.

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