Grazing wheat crops to reduce supplementary feeding in mixed wheat and sheep farms in southern Australia

Dean Thomas and Katrien Descheemaeker
CSIRO

Key messages

- **Grazing a spring wheat crop reduced the supplementary feeding required from 17.8 to 16.3 % of the seasonal energy intake of sheep on average across the locations that were studied.**
- **This is part of a National Grain & Graze project with a diverse range of locations across WA, SA and Victoria being used in the study in order to identify trends across a number of climate 'transects'.**
- **Grazing crops were used more frequently (in 52% of years) for farms located in drier climates, compared with higher rainfall sites where they were used in 17% of years.**
- **Increased use of grazing crops in drier areas was in part due to the later establishment of pastures, compared with crops, at these sites. Use of winter wheat varieties may increase opportunities to graze crops in higher rainfall areas.**
- **Grazing crops had a relatively small overall contribution to the farm feedbase, however crops tended to be grazed in seasons when pastures were late to establish, so in these years access to grazing crops may help reduce supplementary feeding.**

Why do the trial?

This modelling study was conducted to compare how the use of feed components in a mixed wheat and sheep farm are affected when grazing of immature crops is allowed. A number of studies have shown that grazing crops at early growth stages (prior to stem elongation) has little effect on subsequent crop yields. This grazing window often coincides with a shortage in feed supply in early winter. To date, research on grazing crops has focused on the use of specialist dual-purpose crop varieties in higher rainfall areas, where earlier sowing and delayed crop maturity allows more frequent and longer grazing opportunities during each season. However, in the drier regions in southern Australia the use of dual-purpose crops (crops that are grown for both grain and grazing) has increased because of their potential to increase profitability in mixed farming systems (Kirkegaard, 2008). In this study, we used a mixed farm simulation model to investigate the value of grazing a spring wheat variety opportunistically, where priority is given to preserving crop yields.

How was it done?

A simulation experiment was conducted using the AusFarm biophysical model (Moore, 2007), based on a self-replacing Merino sheep and wheat growing enterprise with or without crop grazing. The simulation study used climate data from 1961-2010 from 15 sites across southern Australia, representing the range of climates that exist in the main grain growing regions of southern Australia. High, medium and low rainfall sites (transects) were selected for each of 5 agricultural regions (WA – Northern Agricultural, Central Wheatbelt, South-east Coast, SA – Eyre Peninsula, Victoria – Mallee). Farm stocking rate was determined according to the total annual rainfall at each location (i.e. dry sheep equivalents (DSE) per winter grazed ha = 0.0225 x annual rainfall (mm) - 2).

Two 4-year rotation sequences were applied within the model, across the 8 paddocks allocated to crop and pasture rotations. A single rotation sequence (pwww) was used in 4 of the paddocks (each 500 ha), and one of two rotation sequences (pwww or pddd) was used in the other 4 paddocks (each 200 ha), where p = annual pasture, w = wheat and d = wheat crops that were allowed to be grazed if certain conditions were met (see section on grazing rules). A further 2 paddocks (each 100 ha) in the model were not cropped and were managed as permanent pastures. The energy intake of green and dry pasture, permanent pasture, crop stubbles, supplementary feed and dual-purpose crop consumed by livestock was determined for 2 scenarios, being (1) with or (2) without sheep having access to grazing crops.

Table 1 Use of grazing spring wheat crops on their effect on level of supplementary feeding in a representative self-replacing Merino ewe and wheat cropping enterprise at a range of locations across southern Australia

	Supplementary feeding (% of energy intake)			
Location	**without wheat grazing**	**with wheat grazing**	**% of years crops are grazed**	**Duration of crops grazing (days)**
Badgingarra, WA	21.7	17.4	46	17
Bendigo, Vic	9.5	9.7	6	33
Binnu, WA	25.2	22.2	80	17
Charlton, Vic	10.6	9.7	16	17
Cleve, SA	16.4	14.3	10	12
Cummins, SA	13.4	12.5	8	12
Esperance, WA	10.9	10.5	14	11
Kojonup, WA	20.4	20.1	12	18
Kyancutta, SA	31.0	28.1	60	18
Merredin, WA	16.6	14.8	56	18
Mingenew, WA	23.2	20.3	78	16
Salmon Gums, WA	16.1	15.2	26	17
Scadden, WA	11.6	11.5	8	17
Swan Hill, Vic	21.3	20.5	38	18
Wickepin, WA	19.0	17.6	36	18
WA - Northern Agricultural	23.4	20.0	68	17
WA - Central Wheatbelt	18.7	17.5	35	18
WA - South-East Coast	12.9	12.4	16	15
SA - Eyre Peninsula	20.3	18.3	26	14
Vic - Mallee	13.8	13.3	20	22
Low rainfall	22.0	20.2	52	18
Medium rainfall	16.1	14.7	30	16
High rainfall	15.2	14.0	17	18
Grand mean	**17.8**	**16.3**	**33**	**17**

Table 2 Percentage change in the use of feed components when grazing of dual-purpose crops is permitted in a representative self-replacing Merino ewe and wheat cropping enterprise at a range of locations across southern Australia

	Feedbase component (%)				
Location	**Annual pasture**	**Permanent pasture**	**Crop stubbles**	**Supplementary feed**	**Dual-purpose wheat**
Badgingarra, WA	0.8	1.5	0.0	-4.3	2.1
Bendigo, Vic	-0.3	-0.3	0.0	0.2	0.4
Binnu, WA	-0.1	-0.2	-0.5	-2.9	3.8
Charlton, Vic	0.0	0.8	-0.6	-0.9	0.7
Cleve, SA	0.0	1.9	-0.1	-2.1	0.3
Cummins, SA	0.7	0.0	0.0	-1.0	0.2
Esperance, WA	0.2	-0.1	-0.1	-0.4	0.4
Kojonup, WA	-.01	-0.1	-0.1	-0.3	0.5
Kyancutta, SA	0.0	0.3	-0.4	-2.8	2.9
Merredin, WA	-0.1	-0.7	0.1	-1.9	2.7
Mingenew, WA	-0.1	-0.1	-0.3	-2.9	3.4
Salmon Gums, WA	0.0	-0.5	0.2	-0.9	1.2
Scadden, WA	-0.3	0.0	0.0	-0.1	0.4
Swan Hill, Vic	0.1	-1.1	0.0	-0.8	1.8
Wickepin, WA	0.1	0.0	-0.4	-1.4	1.7
WA - Northern Agricultural	0.2	0.4	0.3	-3.4	3.1
WA - Central Wheatbelt	-0.1	-0.3	-0.1	-1.2	1.6
WA - South-East Coast	0.0	-0.2	0.1	-0.5	0.7
SA - Eyre Peninsula	0.2	0.7	-0.1	-2.0	1.1
Vic - Mallee	-0.1	-0.2	-0.2	-0.5	1.0
Low rainfall	0.0	-0.5	-0.1	-1.9	2.5
Medium rainfall	-0.1	0.5	-0.3	-1.5	1.3
High rainfall	0.2	0.2	0.0	-1.2	0.7
Grand mean	**0.0**	**0.1**	**-0.1**	**-1.5**	**1.5**

What does this mean?

- Grazing spring variety wheat crops is likely to reduce farm supplementary feeding cost marginally, and may be more important in years with late pasture establishment. Using the crop grazing rules set for this study, the impact on grain yield is likely to be minimal. In particular, farmers in lower rainfall areas should benefit from grazing spring variety wheat crops at a frequency of about every second year.
- The greater effect for lower rainfall sites may be due to a greater difference in the relative availability of crops versus pastures for grazing, as was reported by Thomas (2011). That is, that the time difference between when crops and annual pasture have grown enough to be grazed is longer at lower rainfall sites.
- Grazing crops will be most beneficial and achievable in years where the season break does not occur until early May, or later. This is because crops are more likely to be available for grazing before pasture mass reaches 800 kg/ha.
- To avoid crop yield penalties from grazing, it is critical that crops only be grazed after they have adequately established (typically 4-6 weeks after sowing), and sheep be removed before wheat plants mature to the stem elongation stage (GS30).

Acknowledgements

This project was supported by the Australian Grains Research and Development Corporation and the CSIRO Sustainable Agriculture Flagship. We would like to acknowledge the 'Grain and Graze 2' regional project groups, including Eyre Peninsula Grain & Graze, for their input on farming systems and management to inform the model.

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