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*Animal Production Science*

**Supplementary Material**

# Modelling the impact of increasing supplementary feed allowance on predicted sheep enterprise production, profit and financial risk across southern Australia

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## Supplementary Tables

Table S1: Soil, crop and pasture characteristics, rotation, and validation reference for each model location. At each location, land use sequences [A] were employed, separated by a comma (,); P = permanent pasture, L = long fallow rotation (no cropping or grazing), W = wheat crop rotation, B = barley crop rotation, C = canola crop rotation and A = annual clover. A dash ('-') represents not applicable.

| Location | Soil type | Land use sequence [A] | Crop area proportion | Pasture area proportion | Crop species | Pasture species |
|---|---|---|---|---|---|---|
| | | | | NSW | | |
| Bookham | Sandy to sandy loam | P,P | - | 1.00 | - | *Micolaena* spp., *Trifolium subterraneum* (Seaton Park) and *Lolium rigidum* |
| Bungarby | Basalt | P,P | - | 1.00 | - | *Austrostipa* spp., *Poa sieberiana* and *Trifolium subterraneum* (Seaton park) |
| Condobolin | Sandy loam over sand to light clay | PPPLWWBW, P | 0.31 | 0.69 | Wheat, barley, | *Trifolium subterraneum* (Dalkeith), *Medicago truncatula* (paraggio), annual grass |
| Glen Innes | Sandy clay-loam | P,P | - | 1.00 | - | *Festuca arundinacea*, *Austrodanthonia* spp. and *Trifolium repens* |
| Narrandera | Brown Chromosol | P,P | - | 1.00 | - | *Austrostipa* spp., *Trifolium subterraneum* (Seaton park) and *Lolium rigidum* |
| Trangie | light over medium clay, sandy at depth | PPPLWWWB, P | 0.31 | 0.69 | Wheat, barley, | *Medicago sativa* (winter active), *Trifolium subterraneum* (Dalkeith) and annual grass |
| | | | | VIC | | |
| Hamilton | Sandy loam over clay | PPWBW, P, P | 0.20 | 0.80 | Wheat, barley, | *Medicago sativa* (winter active), *Lolium perenne*, *Trifolium subterraneum* (Leura) and *Phalaris aquatica* L. |
| | | | | SA | | |
| Keith | Shallow sandy loam on calcrete | AAWCW, P, P | 0.20 | 0.80 | Clover, wheat, canola, | *Medicago sativa* (semi winter active), annual grass *Trifolium subterraneum* (Leura) and *Phalaris aquatica* L. |

[A] Land use sequence: at each location simulated paddocks (n = 16) were rotated through a series or pasture or cropping rotations (if applicable), allowing land to be divided and used for a certain purpose in sequence.

Table S2: Income (AUD $/ha) from lamb production (combined male and female production) for each simulated enterprise at the low grain allowance (LGA) and high grain allowance (HGA). A simulation that did not meet at least one sustainability index is represented by a dash ('-').

| | | Composite | | | Maternal | | | Merino | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Spring | Summer | Autumn | Spring | Summer | Autumn | Spring | Summer | Autumn |
| Location | Grain allowance[A] | | | | | NSW | | | | |
| Bookham | LGA | 478 | 502 | 494 | 514 | 558 | 451 | 378 | 327 | 295 |
| | HGA | 504 | 567 | 494 | 543 | 620 | 451 | 392 | 338 | 312 |
| Bungarby | LGA | - | - | - | - | - | - | - | 86 | 55 |
| | HGA | - | - | - | - | - | - | - | 98 | 114 |
| Condobolin | LGA | 84 | 81 | 78 | 99 | 144 | 88 | 43 | 65 | 44 |
| | HGA | 84 | 152 | 177 | 99 | 188 | 165 | 43 | 65 | 100 |
| Glen Innes | LGA | 576 | 486 | 617 | 618 | 590 | 661 | 442 | 403 | 495 |
| | HGA | 576 | 486 | 617 | 618 | 590 | 661 | 442 | 403 | 495 |
| Narrandera | LGA | 91 | 114 | 99 | 106 | 97 | 77 | 93 | 78 | 52 |
| | HGA | 134 | 114 | 99 | 106 | 97 | 77 | 93 | 78 | 52 |
| Trangie | LGA | - | 111 | 111 | - | 138 | 124 | 63 | 81 | 100 |
| | HGA | - | 111 | 111 | - | 138 | 124 | 63 | 81 | 100 |
| | | | | | | VIC | | | | |
| Hamilton | LGA | 87 | 165 | 237 | 195 | 209 | 274 | 116 | 167 | 198 |
| | HGA | 162 | 205 | 237 | 195 | 259 | 309 | 155 | 167 | 198 |
| | | | | | | SA | | | | |
| Keith | LGA | 182 | 178 | 169 | 181 | 222 | 194 | 112 | 125 | 112 |
| | HGA | 182 | 178 | 169 | 181 | 222 | 194 | 112 | 125 | 112 |

[A]LGA = all ewes can consume up to a threshold 30 kg/head.year in all years, and in four out of ten years to consume more than this threshold. HGA = Merino ewes can consume up to a threshold 35 kg/head.year in all years and non-Merino ewes up to 42 kg/head.year in all years, and in four out of ten years for all ewes to consume more than these threshold levels.

Table S3: Income (AUD $/ha) from ewe wool sales for each simulated enterprise for each breed, mating season and location at the low grain allowance (LGA) and high grain allowance (HGA). A simulation that did not meet at least one sustainability index is represented by a dash ('-').

| | | Composite | | | Maternal | | | Merino | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Spring | Summer | Autumn | Spring | Summer | Autumn | Spring | Summer | Autumn |
| Location | Grain allowance[A] | | | | | NSW | | | | |
| Bookham | LGA | 51 | 65 | 75 | 89 | 109 | 113 | 358 | 317 | 430 |
| | HGA | 55 | 74 | 75 | 98 | 130 | 113 | 386 | 342 | 473 |
| Bungarby | LGA | - | - | - | - | - | - | - | 126 | 68 |
| | HGA | - | - | - | - | - | - | - | 144 | 162 |
| Condobolin | LGA | 10 | 10 | 10 | 19 | 29 | 19 | 43 | 66 | 45 |
| | HGA | 10 | 20 | 24 | 19 | 38 | 38 | 43 | 66 | 111 |
| Glen Innes | LGA | 78 | 75 | 88 | 118 | 117 | 139 | 491 | 481 | 573 |
| | HGA | 78 | 75 | 88 | 118 | 117 | 139 | 491 | 481 | 573 |
| Narrandera | LGA | 10 | 15 | 15 | 18 | 18 | 19 | 81 | 83 | 63 |
| | HGA | 15 | 15 | 15 | 18 | 18 | 19 | 81 | 83 | 63 |
| Trangie | LGA | - | 15 | 14 | - | 29 | 28 | 64 | 86 | 109 |
| | HGA | - | 15 | 14 | - | 29 | 28 | 64 | 86 | 109 |
| | | | | | | VIC | | | | |
| Hamilton | LGA | 9 | 19 | 31 | 35 | 36 | 56 | 120 | 167 | 243 |
| | HGA | 19 | 25 | 31 | 35 | 45 | 66 | 182 | 167 | 243 |
| | | | | | | SA | | | | |
| Keith | LGA | 26 | 21 | 19 | 38 | 40 | 40 | 132 | 113 | 114 |
| | HGA | 26 | 21 | 19 | 38 | 40 | 40 | 132 | 113 | 114 |

[A]LGA = all ewes can consume up to a threshold 30 kg/head.year in all years, and in four out of ten years to consume more than this threshold. HGA = Merino ewes can consume up to a threshold 35 kg/head.year in all years and non-Merino ewes up to 42 kg/head.year in all years, and in four out of ten years for all ewes to consume more than these threshold levels.

Table S4: Income (AUD $/ha) from cast for age ewe sales for each simulated enterprise for each breed, mating season and location at the low grain allowance (LGA) and high grain allowance (HGA). A simulation that did not meet at least one sustainability index is represented by a dash ('-').

| | | Composite | | | Maternal | | | Merino | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Spring | Summer | Autumn | Spring | Summer | Autumn | Spring | Summer | Autumn |
| Location | Grain allowance[A] | | | | | NSW | | | | |
| Bookham | LGA | 151 | 196 | 257 | 123 | 162 | 166 | 202 | 248 | 242 |
| | HGA | 163 | 234 | 257 | 135 | 188 | 166 | 214 | 260 | 266 |
| Bungarby | LGA | - | - | - | - | - | - | - | 66 | 35 |
| | HGA | - | | - | - | - | - | - | 76 | 78 |
| Condobolin | LGA | 25 | 29 | 31 | 25 | 41 | 27 | 27 | 42 | 28 |
| | HGA | 25 | 56 | 72 | 25 | 54 | 54 | 27 | 42 | 69 |
| Glen Innes | LGA | 206 | 192 | 219 | 165 | 167 | 184 | 261 | 251 | 286 |
| | HGA | 206 | 192 | 219 | 165 | 167 | 184 | 261 | 251 | 286 |
| Narrandera | LGA | 25 | 42 | 41 | 23 | 28 | 28 | 51 | 53 | 40 |
| | HGA | 37 | 42 | 41 | 23 | 28 | 28 | 51 | 53 | 40 |
| Trangie | LGA | - | 40 | 39 | - | 40 | 40 | 39 | 54 | 68 |
| | HGA | - | 40 | 39 | - | 40 | 40 | 39 | 54 | 68 |
| | | | | | | VIC | | | | |
| Hamilton | LGA | 28 | 56 | 86 | 52 | 54 | 85 | 66 | 98 | 140 |
| | HGA | 51 | 68 | 86 | 52 | 66 | 99 | 97 | 98 | 140 |
| | | | | | | SA | | | | |
| Keith | LGA | 58 | 59 | 68 | 39 | 56 | 60 | 78 | 72 | 72 |
| | HGA | 58 | 59 | 68 | 39 | 56 | 60 | 78 | 72 | 72 |

[A]LGA = all ewes can consume up to a threshold 30 kg/head.year in all years, and in four out of ten years to consume more than this threshold. HGA = Merino ewes can consume up to a threshold 35 kg/head.year in all years and non-Merino ewes up to 42 kg/head.year in all years, and in four out of ten years for all ewes to consume more than these threshold levels.

References:

Bates, AL, McGrath, SR, Allworth, MB, Robertson, SM, Refshauge, G (2023) A cross-sectional study of commercial ewe management practices for different sheep breeds across southern Australia. *Animals* **13**, 388.

NSW DPI (2021) 'Livestock gross margin budgets.' Available at https://www.dpi.nsw.gov.au/agriculture/budgets/livestock [Verified 8 October 2021]

**Summary text**

Supplementary feeding sheep is an important nutritional and reproductive management practice; however, can be expensive. Increased financial risk has often been associated with increased supplementary feeding and was apparent in the current study in association with mating season, but was not linked to breed. Producers may be able to improve the production, profit and financial risk of an enterprise through increased supplementary feeding, but this will be dependent on breed, input costs, commodity prices and location.