BEEFSPECS CALCULATOR

Using BeefSpecs to help meet beef market specifications

The BeefSpecs calculator is an electronic tool that helps producers meet market specifications. The key to meeting customer needs is to understand the market specifications. To deliver beef cattle to a specification, producers need to assess and monitor animal growth, manage the feedbase, regularly evaluate marketing options, and seek feedback on animal performance.

1. Market specifications

Current market specifications for beef cattle are primarily based on Hot Standard Carcase Weight (HSCW) and rump (P8) or rib fat thickness (see Figure 1). BeefSpecs allows you to explore factors that affect fat thickness. You can use this information to alter animal growth, thereby increasing the proportion of animals meeting market specifications.
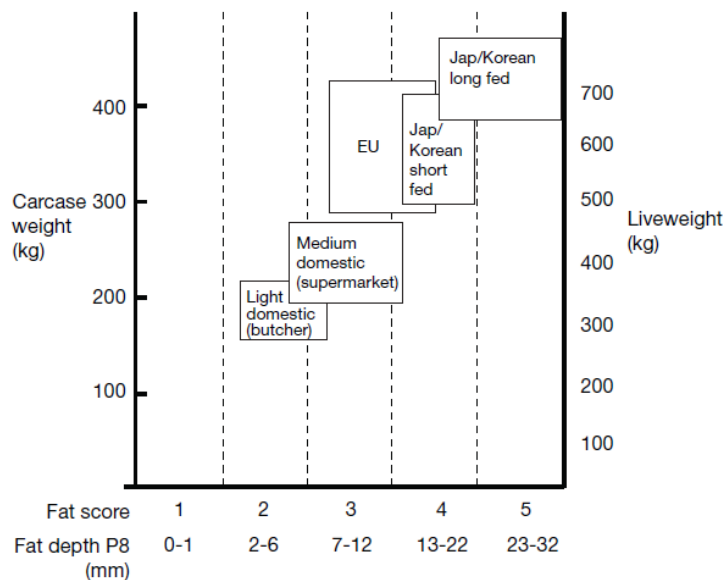

Figure 1. Liveweight and carcase (ie HSCW and fat score/P8 fat thickness) specifications for a variety of Australian beef cattle markets. Source: T Andrews and B Littler (2007).

BeefSpecs can be used in conjunction with market specifications for trading stock (e.g. preparation of feeder cattle) or for slaughter cattle.

The capacity of cattle to achieve target weight and fatness specifications is determined by breed type, frame score, sex, feed type (predominantly grass or grain), and use of hormone growth promotants (HGPs). BeefSpecs predicts final P8 or rib fat thickness and HSCW, using information concerning the relationships between current liveweight, fat (P8 or rib) thickness, frame score and projected growth rate of cattle. It also takes account of feed type (ie grass or grain) and where applicable, use of HGPs. BeefSpecs allows you to understand how you can change these factors to better achieve target market specifications. BeefSpecs calculations are based on group averages (>= 10 animals).

2. What does BeefSpecs look like and what does it do?

BeefSpecs has three tabs labelled: 'Animal', 'Management' and 'Performance' — and a green 'Results' section on the right hand side. You can click on each tab to input the following relevant information:

• Animal Tab — sex, average frame score of the group, and breed type. If you know average hip height and age (months) you can input that information directly instead of frame score.

• Management Tab — feed type and HGP status (implanted and type).

• Performance Tab — the option is available to use either P8 or rib fat depth as an input to BeefSpecs and to have either P8 or rib fat depth predicted as an output. The initial liveweight, initial fat thickness (P8 or rib), anticipated average growth rate, number of days on feed (time between starting date and target finish date), and estimated dressing percentage are required.

To see changes in final liveweight, P8 or rib fat thickness and HSCW in the Results section click on 'Run' (top right-hand side of the calculator). As the mouse hovers over the titles of each input a 'pop up box' appears containing information about the required inputs. If you input values outside the appropriate range a warning box appears reminding you of the allowable range. You must enter a value within the allowable range (see Table 1).

Table 1: Acceptable range and unit values of numerical inputs used in BeefSpecs

Input	Units	Minimum	Maximum
Initial liveweight	kg	175	550
Initial P8 fat depth	mm	2	15
Initial rib fat depth	mm	2	10
Frame score	-	3	9
Estimated dressing percentage (DP%)	%	50	65
Days on feed	days	25	225
Estimated average daily gain (ADG)	kg/hd/day	0	2.0

After entering information about your cattle in the Animal tab, you can explore the effects of management and performance options by changing values in the Management and Performance tabs.

2.1 Animal tab

On the Animal tab, you can input information relating to the current or initial status of the group of cattle that you want to assess (see Figure 2).
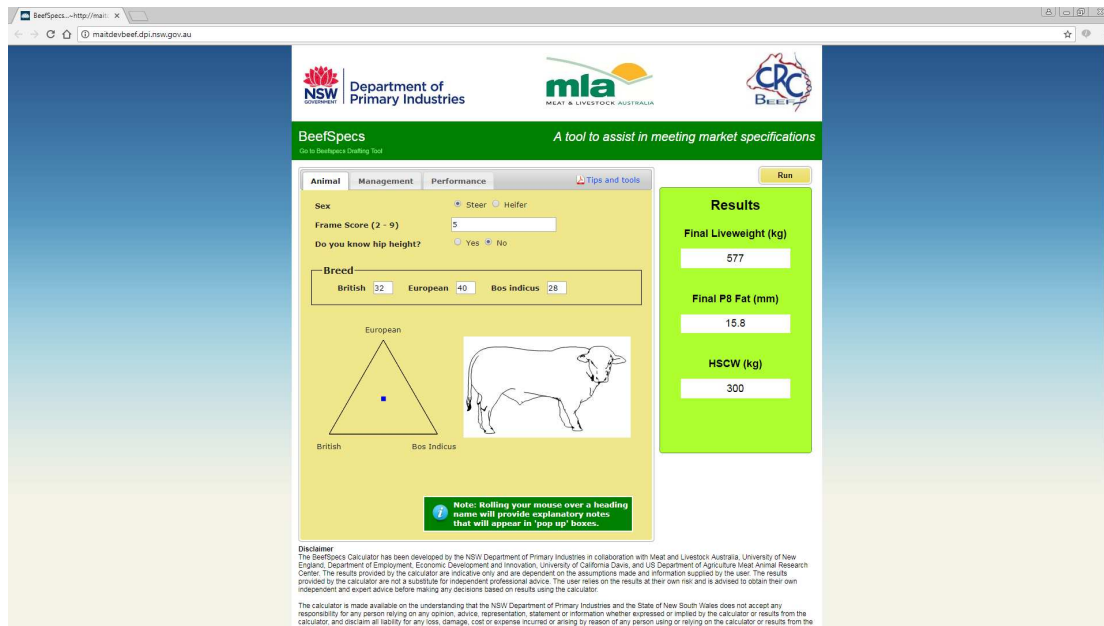
Figure 2: The on-screen display of the 'Animal' tab in BeefSpecs, which is used to input information about the characteristics of your cattle

2.1.1 Sex
The relative rates of muscle and fat deposition differ between castrated male and female cattle. BeefSpecs predicts carcase parameters of steers and heifers. BeefSpecs is not suitable for predicting carcase attributes of bulls.

2.1.2 Frame score
Frame score is an estimate of the relative size of cattle (see Figure 3) and is assessed on a 1 to 9-point scale, with '1' being the lowest mature body weight animals and '9' being the highest mature body weight animals. Most British breeds will fall into the 1–7 range for frame score and most European breeds will fall in the 4–9 range. Frame score is estimated from hip height of an animal at a known age. If the animal's hip height and age are known, click the 'Yes' button. BeefSpecs will then ask for age (months) and hip height (cm) to be entered and calculate frame score automatically. If you answer 'No', an estimate of frame score needs to be entered.

TYPICAL FRAME SCORE	MARKET SUITABILITY					MATURITY TYPE
	LIGHT DOMESTIC	MEDIUM DOMESTIC	HEAVY DOMESTIC / EU	SHORT FED EXPORT	LONG-FED EXPORT	
1, 3						Early maturing—small frame • Generally short in all skeletal dimensions (breadth and length). • Tend towards lower retail beef yield and/or DP%. • Lack rapid growth potential but can still show good muscle expression. • Generally reach market potential at lower carcase weights (eg; 150–180kg HSCW / 9–12mm P8 fat).
3, 4, 5						Moderate maturing—average frame • Average growth potential rising to good growth for frame 5s. • Generally good length of body and, particularly in British breeds, can have good muscle development. • Generally reach market potential at ~200–350kg HSCW and 9–12mm P8 fat.
6, 7, 0						Late maturing—large frame • Much larger cattle with high growth potential and % lean. • Non-continental breeds of this size generally lack muscle expression. • Reach market potential much later at carcase weights of 350–450kg with 9–12mm of fat. • Suitable for long fed feedlot markets pending structural soundness, muscling potential and marbling propensity.
9, 10, 11						Very late maturing—very large frame • Huge cattle with extreme growth potential, and usually extremely lean. It is doubtful if animals of this size will achieve enough fat for any quality market.

Figure 3: Frame score, suitability for markets and maturity type attributes of beef cattle (adapted from NSW Department of Primary Industries). Green = Middle of range, attributes more likely to occur. Yellow = Extremes, attributes less likely to occur.

Frame score charts are available in the appendix Table A1 and A2 or can be obtained from the following internet address:
https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/appraisal/publications/frame-scoring

2.1.3 Breed
Select the breed type (as opposed to breed) that best describes the animals in the group being assessed. Breed type may be either Bos indicus (e.g. Brahman animals or breed derivatives), British (eg. Angus, Hereford, Shorthorn) or European (e.g. Charolais, Limousin, Simmental), or a combination of these. For crossbred animals of unknown composition, use the breed type graphic to morph animal shape until it best matches the animals in the group being assessed. This will provide an estimate of breed type percentages.

Table 2 provides guidelines for specifying *Bos indicus* content for cattle of known breed composition.

Table 2: *Bos indicus* content for cattle of known breed composition.

Breed	BI content (%)
Boran	100%
Brahman	100%
Braford	50%
Brangus	50%
Charbray	50%
Droughtmaster	50%
Santa Gertrudis	38%

2.2 Management tab

On the Management tab, you can input information related to the management of the group of cattle that you want to assess (see Figure 4).
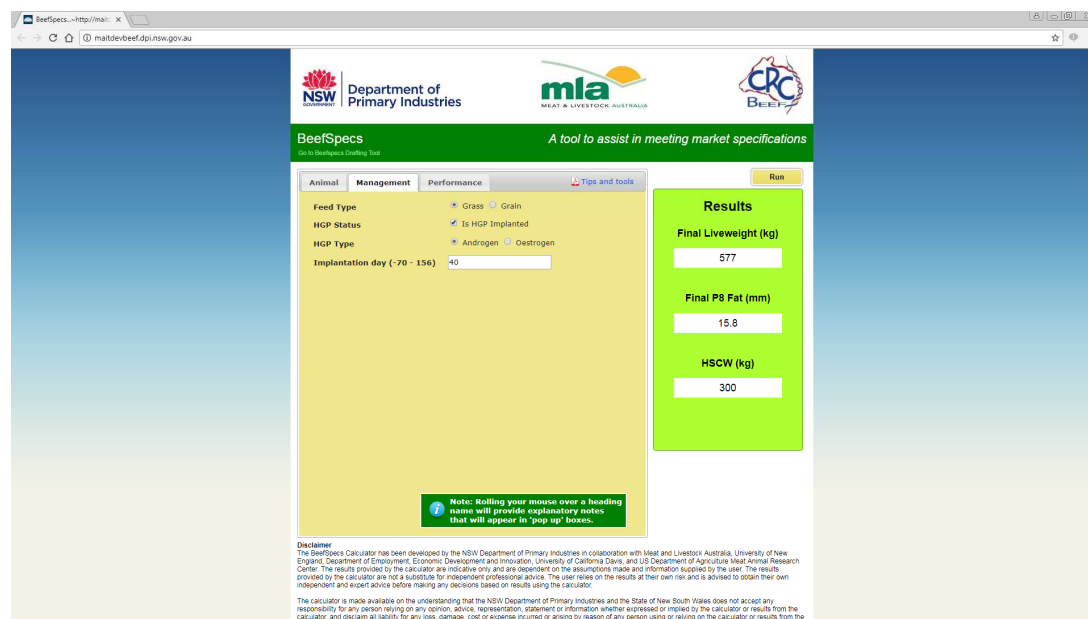

Figure 4: The on-screen display of the 'Management' tab in BeefSpecs, which is used to input information about how your cattle have been managed.

2.2.1 Feed type

Choose one of the following options that best describes the type of feed offered or available for the feeding period:
• 'Grain' – a concentrate-based diet with greater than 70% grain content.
• 'Grass' – a roughage-based diet with less than or equal to 70% grain content.
If you select the Grain option, BeefSpecs will automatically assume a dressing percentage 2% higher than animals on a grass based diet (i.e. 52% for grass vs 54% for grain – see Performance tab below).

2.2.2 HGP Implanted

Hormonal growth promotants (HGPs) increase cattle growth rates. Some types of HGPs may also reduce the relative rate of fat deposition (eg androgen-based HGPs).

Use the following guide to help select the correct answer for the 'HGP Implanted' field. Select 'Yes' (and adjust estimated ADG by + 10% in the Performance tab) if your cattle have been implanted and are within the effective life (or payout period) of a HGP. If you have selected yes, an additional button will appear asking if you have used Androgen or Oestrogen based implants.

Androgenic implants include the following products (see Appendix Table A3.):
• Revalor S / G / H
• Synovex-Plus / H
• Progro TE-S / TE-H / H
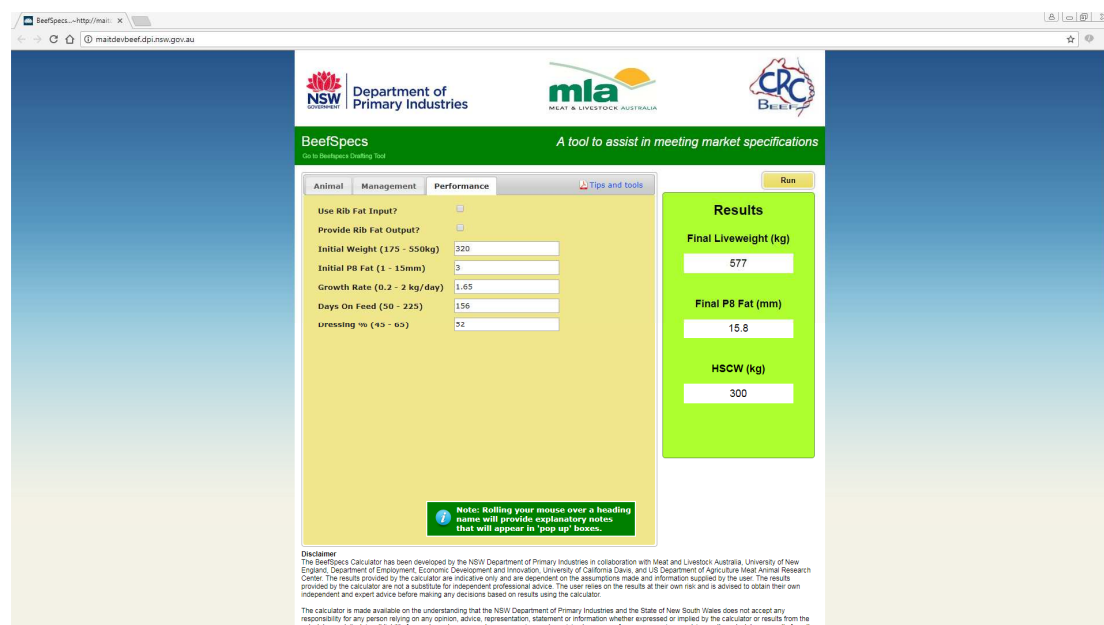• Component TE-S / TE-H / TS / TH / H

Oestragenic implants include the following products:
• Synovex-S / C
• Progro-S
• Compudose 100 / 200 / 400
• Ralgro

Note: if you have chosen Androgenic implants - remember to adjust ADG to the expected gain (typically 10% faster growth than non-implanted cattle).

2.3 Performance tab

On the Performance tab, you can input information related to the production performance of the group of cattle that you want to assess (see Figure 5).

Figure 5: The on-screen display of the 'Performance' tab in BeefSpecs, which is used to input information about the current status and anticipated performance of your cattle

2.3.1 Initial weight (kg)
Obtain the average initial weight (in kilograms) of the group of animals by weighing them all, or at least a representative sample of the group.

2.3.2 Initial P8 or rib fat
BeefSpecs allows either P8 or rib fat to be used as an input or predicted as an output, which can occur independently (i.e. P8 can be supplied as an input while rib fat can be predicted as the output). Estimate the initial (or starting) rump (P8) or rib fat thickness of the group of animals. Both P8 and rib fat thickness can be measured directly using ultrasound methods or converted from a fat score appraisal using Table 3.

Table 3: Relationship between fat score and estimated P8 or rib fat thickness (mm)

Fat score	P8 fat depth (mm)	Rib fat depth (mm)
1	0-2	0-1
2	3-6	2-3
3	7-12	4-7
4	13-22	8-12

Note: BeefSpecs is designed for young growing cattle and does not support an initial P8 fat thickness greater than 15mm or a rib fat thickness greater than 10mm. Further information on fat scoring and estimating fat thickness is available on the NSW Department of Primary Industries website.
https://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/appraisal/publications/live-cattle-assessment

2.3.3 Growth rate
An estimate of the average daily gain (ADG) of the group of animals anticipated over the feeding period you wish to consider is required. Estimates of ADG should be based on information and experience derived from your own property for the expected growth rate of cattle in the production systems that you normally use. If you are using HGP implants, increase the ADG by 10% over non-implanted cattle (see 'Management tab' 2.2.2, above).

Note: To understand how these variables affect target specifications you can use BeefSpecs to explore the ADG required across the group to achieve a target liveweight and fatness outcome. Set the initial liveweight, frame score, P8 or rib fat thickness and days on feed, then alter ADG and, if necessary, the management inputs. BeefSpecs does not provide information on how to achieve a target growth rate. It is best to use local advice and/or modelling programs such as GrazFeed® to estimate the amount and quality of feed or supplements required to achieve a target growth rate. Attending a BeefSpecs information session will also provide information to help estimate achievable ADG using feed on offer.

2.3.4 Days on feed
Insert the length of the grazing or feeding period that you wish to consider (minimum 25 days, maximum 225 days).

2.3.5 Dressing %
Estimate dressing percentage for the group of cattle that you want to assess. BeefSpecs uses this figure to estimate HSCW from the predicted liveweight. Default values are 52% and 54% for grass- and grain-based diets, respectively. You can alter the default values based on your own records. Information on likely dressing percentages for different cattle types and production systems is available at the NSW Department of Primary Industries website.
http://www.dpi.nsw.gov.au/animals-and-livestock/beef-cattle/appraisal/publications/dressing-percentages-cattle

3. Run Button
Once all input fields have been filled out in the Animal, Management and Performance tabs the model needs to be re-run by clicking the 'Run' button. The model will then predict P8 or rib fat depth (whichever is selected), liveweight and HSCW at the end of the feeding period and enter this information in the fields in the Results section.

4. Results section
In the Results section, you will see changes in liveweight, P8 or rib fat thickness and HSCW, relative to changes in BeefSpecs inputs, by clicking the 'Run' button.

4.1 Final liveweight
This is the calculated liveweight at the end of the specified feeding or grazing period. It is derived solely from your specified inputs for initial liveweight, ADG and the length of the feeding or grazing period.

4.2 Final P8 or rib
This is the predicted rump (P8) or rib fat thickness for your specified inputs. It is obtained from a prediction of fat deposition based on the animal's growth path and relative state of maturity.

4.3 Hot Standard Carcase Weight (HSCW)
This is the calculated weight of the dressed carcase trimmed to AUS-MEAT standard specifications. It is derived from the final liveweight and the estimated dressing percentage.

BeefSpecs is designed to demonstrate how management decisions affect fat thickness and the suitability of cattle for markets. It was originally developed using data on *Bos taurus* steers grown under feedlot conditions but it has been extended to account for production in pasture-based systems and is applicable for both steers and heifers of *Bos taurus* or *Bos indicus* breed types.

5. A worked example
You know that your Angus steers are currently 320kg and, on average, they have 3mm P8 fat and are frame score 5. At present, they have not been implanted with a HGP and are grazing pasture. You anticipate that they will grow at 1.0 kg/day for the next 120 days. The BeefSpecs calculator predicts these cattle will weigh 440kg, have 5.9 mm of P8 fat and have a HSCW of 229kg at the end of 120 days. You might be happy with this if you are targeting a feedlot, but if you wanted to see if they were suitable for a slaughter market, you could explore some options.

You might consider increasing growth rate to 1.5kg/day (by improving grazing management and pasture availability). To assess this change in BeefSpecs you increase ADG to 1.5kg/day in the Performance tab. At 120 days, BeefSpecs now predicts that the cattle would weigh 500kg, have 10.2 mm P8 fat and have a HSCW of 260kg. If you thought you could sustain this growth rate for 180 days, you could increase Days on Feed to 180 days in the Performance tab. BeefSpecs now predicts the cattle would weight 590kg, have 15.7 mm P8 fat and have a HSCW of 307kg. Perhaps you want to use an androgen-based HGP to reduce the time to achieve an estimated HSCW of 300kg? You would need to alter the variables as follows:
• select the 'Yes' radio button for 'Implants' in the Management tab
• increase estimated ADG by 10% to 1.65kg/day in the Performance tab
• adjust Days on Feed in the Performance tab until you achieve the desired HSCW of 300kg.
BeefSpecs will predict that you could reduce the length of the feeding period to 156 days to achieve a target HSCW of 300kg and that the P8 fat thickness in this scenario would be 15.4 mm.

6. Further information
The BeefSpecs calculator assists producer decision making for management of groups of cattle to meet weight and fat specifications for particular markets. The BeefSpecs calculator requires users to input initial liveweight, P8 or rib fat depth, and frame score (an indication of frame size relative to age) to estimate the growth and maturity parameters of cattle on-farm.

Care is taken to ensure the accuracy of the information contained in this calculator. However Agriculture NSW and the Beef CRC make no warranty or representation, and accept no responsibility, regarding the accuracy, completeness or suitability for any purpose of the information provided and individuals should make their own enquiries and assessments before making any decision concerning their interests. Agriculture NSW and the Beef CRC accept no liability whatsoever for information provided by the calculator or for any loss or damage incurred as a result of reliance (in whole or in part) upon information contained in this calculator.

7. References
Andrews, T. and Littler, B. (2007) Market specifications for beef cattle. NSW Department of Primary Industries, Primefact No. 621.

Appendix

Table A1. Male frame scores based on height measurement at the hip (cm)

Age (months)	Bulls—hip height (cm)										
	Frame score										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
5	85	90	95	100	105	110	116	121	126	131	137
6	88	93	99	104	108	114	119	124	130	135	140
7	92	97	102	107	112	117	122	128	133	138	143
8	95	100	105	110	114	120	125	131	136	141	146
9	98	102	107	113	117	123	128	133	138	144	149
10	100	105	110	115	119	125	130	135	140	146	151
11	102	107	112	117	122	128	133	138	143	148	153
12	104	109	114	119	124	130	135	140	145	150	155
13	106	111	116	121	126	131	137	142	147	152	157
14	108	113	118	123	127	133	138	143	148	154	159
15	109	114	119	124	129	135	140	145	149	155	160
16	110	116	121	126	130	136	141	146	151	156	161
17	112	117	122	127	131	137	142	147	152	157	162
18	113	118	123	128	132	138	143	148	153	158	163
19	114	119	124	129	133	139	144	149	154	160	165
20	115	120	125	130	134	140	145	150	155	160	165
21	116	121	126	131	135	140	146	151	156	161	166
Mature bulls											
24	118	123	128	133	137	142	147	152	157	163	168
30	120	125	130	135	139	145	150	155	160	165	170
36	122	127	132	137	141	146	151	156	161	166	171
48	123	128	133	137	142	147	152	157	162	167	172

Table A2. Female frame scores based on height measurement at the hip (cm)

Age (months)	Females—hip height (cm)										
	Frame score										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
5	84	89	94	99	105	110	115	120	126	131	136
6	87	92	97	102	107	113	118	123	128	134	139
7	89	94	100	105	110	115	121	126	131	136	141
8	92	97	102	107	112	117	122	128	133	138	144
9	94	99	104	109	114	119	124	130	135	140	145
10	96	101	106	111	116	121	126	131	136	141	147
11	98	103	108	113	118	123	128	133	138	144	149
12	99	104	109	114	119	124	130	135	140	145	150
13	101	105	110	116	121	126	131	136	141	146	151
14	102	107	112	117	122	127	132	137	142	147	152
15	103	108	113	118	123	128	133	138	143	148	153
16	104	109	114	119	124	129	134	139	144	149	154
17	105	110	115	120	125	130	135	140	145	149	154
18	106	110	116	121	126	131	135	140	145	150	155
19	107	111	116	121	126	131	136	141	146	151	156
20	107	112	117	122	127	132	137	141	146	151	156
21	108	113	118	123	128	132	137	142	147	152	157
Mature cows											
24	109	114	119	124	129	133	138	143	148	153	157
30	111	116	121	125	130	135	140	145	150	154	159
36	112	117	122	126	132	136	141	145	150	155	160
48	113	118	122	127	132	137	142	146	151	155	160

Table A3: Hormonal growth promotants registered for use in Australia and their principle active compound (androgen and/or oestrogen)*

Trade name	Principal active compound
Progro H	Androgen
Synovex H	Androgen
Progro T-S	Androgen
Progro TE-S	Androgen
Revalor S	Androgen
Synovex with Trenbolone Acetate	Androgen
Progro TE-H	Androgen
Revalor-H	Androgen
Compudose-G	Androgen
Revalor-G	Androgen
Revalor-I	Androgen
Progro S	Oestrogen
Synovex S	Oestrogen
Compudose 100	Oestrogen
Compudose 200	Oestrogen
Compudose 400	Oestrogen
Ralgro	Oestrogen

* As at March 2009

Acknowledgements