

AN INITIATIVE OF

Making More From Sheep



Carrying Capacity, Stocking Rate and Feed Budgeting

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It's ewe time!



Outline

- Definitions and benchmarks
- Determining carrying capacity
- Feed budgeting
 - Paddock/tactical level
 - Seasonal/strategic level



Definitions & Benchmarks

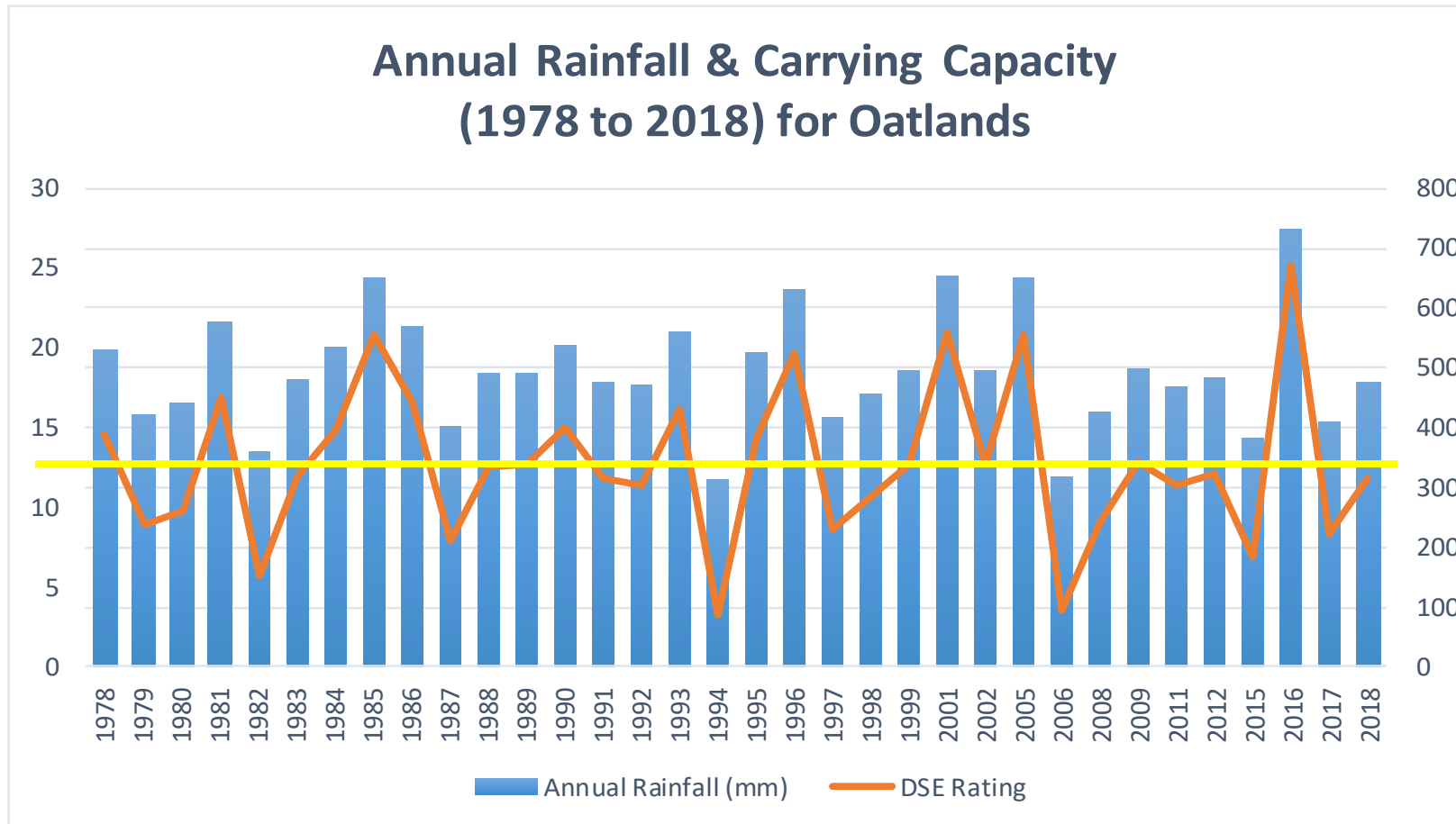
- Carrying capacity = supply of feed
 - Influenced by climate, soil fertility, production system & management
- Stocking rate = demand for feed
 - Animal x performance = demand for feed
- Utilisation = ability to optimise the stocking rate over the carrying capacity (a key profit driver)
 - Utilisation benchmark target:
 - 1 t DM/ha/100mm/ML (Tas MLA benching 2015-17, average @ 656 kg DM/ha/100mm with top 20% @ 856 kg DM/ha/100mm)

Determining Average Annual Carrying Capacity

- Rainfall to DSE model;
 - +1.3 DSE/25mm above 250mm rainfall
 - At 500mm rainfall/yr = 13 DSE/ha/yr
- Growing season, paddock size and soil phosphorus level model;

Growing season (months)	5	6	7	8	9	10	11	12
	Paddock less than 20 ha in size							
Olsen P 10 mg/kg	11	14	17	20	24	28	31	34
Olsen P 20 mg/kg	12	16	19	23	26	29	33	36
	Paddock more than 20 ha in size							
Olsen P 10 mg/kg	8	11	15	18	21	25	28	32
Olsen P 20 mg/kg	10	13	16	20	23	27	30	33

Carrying Capacity – Property Level



- Be flexible and able to deal with seasonal change

Paddock Level & Seasonal Feed Budgeting

Paddock/tactical feed budgeting	Seasonal/strategic feed budgeting
Supports short term (daily or 1 month) feed supply and demand decisions	Supports medium and long term feed supply and demand decisions
Deals with immediate issues: <ul style="list-style-type: none"> - Supplementation program - Stocking rate decisions 	Useful for seasonal and annual planning processes, property development, supplementation policy
Examples: <ul style="list-style-type: none"> - How many animals can I graze on my pasture paddock - How long can I graze my wheat paddock for? 	Examples <ul style="list-style-type: none"> - Identifying seasonal feed surpluses and deficits - Determining the carrying capacity of a property on a monthly and annual basis

How - Tools

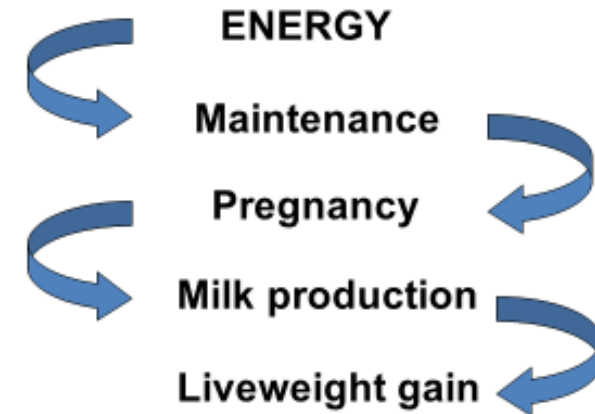
- To effectively feed budget you will need to know;
 1. Animal feed requirements
 2. How much feed do we have?
 3. Access to or build a feed budget tool



	Units		Example
Area	Ha	A	20
Duration of grazing	Days	B	22
Pasture/crop growth rate during grazing	Kg DM/ha/day	C	20
Grazing efficiency wastage	%	D	30%
Animal feed demand	Kg DM/head/day	E	2
Allocatable feed requirement		F	2.6
Current pasture/crop cover	kg DM/ha	G	2000
Desired residual pasture/crop cover	Kg DM/ha	H	1000
Feed grown per hectare	Kg DM/ha	$I = (G - H) + (B \times C)$	1444
Total feed grown	Kg DM	$J = (I \times A)$	28880
Number of animals	head	$K = J / F / B$	500

How – Animal feed requirements

- Dietary energy is prioritised in animals
- Prioritisation is based on a hierarchy of demand, influenced by;
 - Age
 - Animal weight
 - Seasonal conditions



How – Animal feed requirements

- DSE ratings;

Table 14: DSE values for different classes of sheep (Figures calculated from Lifetimewool energy values where 1 DSE = 8.3 MJ ME, — www.lifetimewool.com.au)

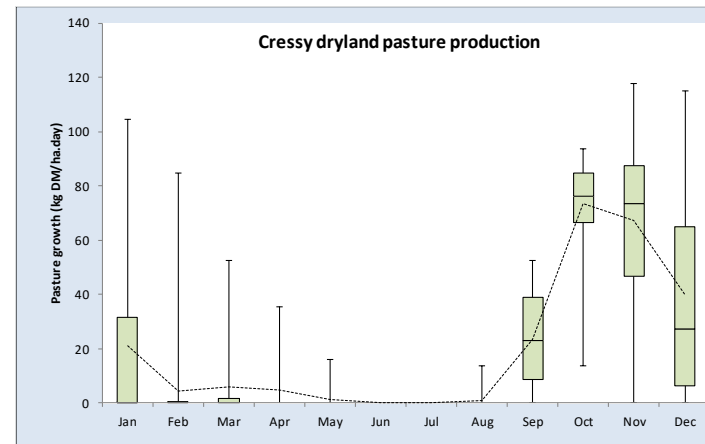
Livestock class	Body Weight (kg)			
	40	50	60	70
Dry sheep	0.8	1	1.2	1.3
Pregnant ewes (last month)				
Single	1.2	1.4	1.6	1.8
Twin	1.4	1.7	2.0	2.2
Lactating ewes				
Single	1.6	1.9	2.2	2.5
Twins	1.9	2.3	2.7	3.0
Ewe/lamb average/year				
Single	1.4	1.7	2.0	2.2
Twins	1.3	1.5	1.7	2.0
Weaned lambs				
Merino (20kg)	0.6–1 depending on rate of liveweight gain			
Xbred (30–40kg)	1–1.5 depending on rate of liveweight gain			

- kg DM/head rules of thumb;

Prioritisation Use	Sheep (kg DM*/head/day) *1 kg DM = 10.5 MJ ME
Maintenance	Immature sheep = LW x 3% Mature sheep = LW x 2%
Pregnancy	Pregnancy stage & if singles/twins = +0.8-1.4
Lactation	Lactation stage & if singles/twins = +0.8-1.8
Liveweight gain	0.25 kg LWG = +1

How – How much feed do we have?

- How much feed do we have;
 - Measurement of green feed;
 - Tools: eye ball, ruler, rising plate meter, NDVI imagery, reference to FOO images
 - Recording number of bales of fodder, size of silage pits, tonnes of grain etc...
- Pasture growth rates;
 - Modelling
 - Pre & post grazing mass (kg DM/ha) divided by the grazing interval (days)
 - “Phone a friend”



Feed Budget Examples

- How many days can I graze my mob of animals on a paddock?

	Units		Example
Area	Ha	A	20
Current pasture/crop cover	Kg DM/ha	B	2000
Grazing efficiency wastage	%	C	30%
Pasture/crop growth rate during grazing	Kg DM/ha/day	D	20
Desired residual pasture/crop cover	Kg DM/ha/day	E	1000
Crop/pasture feed quality	MJ ME	F	12
Number of animals		G	500
Animal feed demand*	Kg DM/head/day	H	2
Adjusted animal feed demand	Kg DM/head/day	$I = (H * 10.5) / F$	1.8
Pasture/crop available feed	Kg DM/ha	$J = B - E$	1000
Total animal consumption	Kg/DM	$K = (I \times G) \times (1+C)$	1137.5
Change in daily consumption	kg DM/ha/day	$L = K / A$	57
Change in feed on offer	kg DM/ha/day	$M = D - L$	-37
Days grazing on crop/pasture	days	$N = M / J$	27

Feed Budget Examples

- How many animals can I graze on my paddock for a given time?

	Units		Example
Area	Ha	A	20
Duration of grazing	Days	B	27
Pasture/crop growth rate during grazing	Kg DM/ha/day	C	20
Grazing efficiency wastage	%	D	30%
Animal feed demand*	Kg DM/head/day	E	2
Crop/pasture feed quality	MJ ME	F	12
Adjusted animal feed demand	Kg DM/head/day	$G = (E \times 10.5) / F$	1.75
Allocatable feed requirement		$H = G \times (1+D)$	2.3
Current pasture/crop cover	kg DM/ha	I	2000
Desired residual pasture/crop cover	Kg DM/ha	J	1000
Feed grown per hectare	Kg DM/ha	$K = (I - J) + (B \times C)$	1540
Total feed grown	Kg DM	$L = (K \times A)$	30800
Number of animals	head	$M = L / H / B$	501

Seasonal Feed Budgets

- Relies on similar data as the paddock level feed budget but over an extended period
- Involves more planning and detailed knowledge of growth rates, animal requirements and feed supply
- MUST be a live document NOT just for show and tell if it's to be used for ongoing decision support

Set Up

Property name:
 Rainfall:
 Adoption of best practice grazing to maximise growth rates:
 Amount of irrigation water applied to pastures (1ML = 100mm):

Somewhere in the midlands
 1,000 mm
 65%
 0 mm

Month		Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	
Days per Period		31	31	30	31	30	31	31	28	31	30	31	30	365
Effective Area														Average
Irrigated pasture	ha	259	259	259	259	259	259	259	259	259	259	259	259	259.4
Dryland (improved) pasture	ha	631	631	631	631	631	631	631	631	631	631	631	631	630.9
Dryland (semi improved) pasture	ha	11	11	11	11	11	11	11	11	11	11	11	11	10.8
Dryland (run) pasture	ha	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Clover (irrigated)	ha	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Lucerne (irrigated)	ha	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Lucerne (dryland)	ha	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Brassica (irrigated)	ha	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Brassica (dryland)	ha	0	0	0	0	0	0	12	12	12	12	0	0	3.8
Cereal	ha	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Total	ha	901	901	901	901	901	901	913	913	913	913	901	901	904.9

Feed Supply

Growth Rates Modelled (where growth rates have NOT been measured on-farm)

	kgDM/ha/day	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	t DM/ha
Irrigated pasture	kgDM/ha/day	10	16	33	42	49	52	52	49	36	20	13	10	12
Dryland (improved) pasture	kgDM/ha/day	8	20	33	65	78	52	17	6	8	8	13	6	10
Dryland (semi improved) pasture	kgDM/ha/day	3	12	27	39	55	20	5	5	5	9	9	5	6
Dryland (run) pasture	kgDM/ha/day	0	2	4	10	23	4	4	4	4	10	10	2	2
Clover (irrigated)	kgDM/ha/day	2	2	25	40	60	80	80	80	50	40	10	2	14
Lucerne (irrigated)	kgDM/ha/day	2	2	25	40	60	80	80	80	50	40	10	2	14
Lucerne (dryland)	kgDM/ha/day	2	2	25	40	60	40	20	15	10	15	10	2	7
Brassica (irrigated)	kgDM/ha/day	20	24	48	84	105	105	105	84	69	48	42	20	23
Brassica (dryland)	kgDM/ha/day	30	39	84	135	180	180	90	60	60	90	60	30	32
Cereal	kgDM/ha/day	25	35	50	80	70	0	0	0	25	30	40	30	12
Weighted Average	kgDM/ha/day	9	18	32	58	69	52	28	19	17	13	13	7	10.2

Growth Rates Actual (where growth rates have been measured on-farm)

	kgDM/ha/day	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	t DM/ha
Irrigated pasture	kgDM/ha/day													0
Dryland (improved) pasture	kgDM/ha/day													0
Dryland (semi improved) pasture	kgDM/ha/day													0
Dryland (run) pasture	kgDM/ha/day													0
Clover (irrigated)	kgDM/ha/day													0
Lucerne (irrigated)	kgDM/ha/day													0
Lucerne (dryland)	kgDM/ha/day													0
Brassica (irrigated)	kgDM/ha/day													0
Brassica (dryland)	kgDM/ha/day													0
Cereal	kgDM/ha/day													0
Weighted Average	kgDM/ha/day	0	0	0	0	0	0	0	0	0	0	0	0	0

Total Pasture Growth

	kgDM	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total
Irrigated	kgDM	78,404	130,673	252,915	339,749	379,373	418,153	418,153	354,081	287,480	151,749	104,538	75,875	2,991,141
Dryland (improved) pasture	kgDM	165,264	381,379	615,128	1,271,264	1,476,306	1,017,011	330,529	103,341	165,264	159,933	254,253	110,723	6,050,394
Dryland (semi improved) pasture	kgDM	1,045	4,178	8,845	13,057	17,690	6,529	1,697	1,533	1,697	2,780	2,873	1,643	63,568
Dryland (run) pasture	kgDM	0	0	0	0	0	0	0	0	0	0	0	0	0
Clover (irrigated)	kgDM	0	0	0	0	0	0	0	0	0	0	0	0	0
Lucerne (irrigated)	kgDM	0	0	0	0	0	0	0	0	0	0	0	0	0
Lucerne (dryland)	kgDM	0	0	0	0	0	0	0	0	0	0	0	0	0
Brassica (irrigated)	kgDM	0	0	0	0	0	0	0	0	0	0	0	0	0
Brassica (dryland)	kgDM	0	0	0	0	0	0	32,085	19,320	21,390	31,050	0	0	0
Cereal	kgDM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	kgDM	244,712	516,230	876,888	1,624,070	1,873,369	1,441,692	782,464	478,276	475,832	345,512	361,663	188,240	9,208,948
Average	kgDM/ha/day	9	18	32	58	69	52	28	19	17	13	13	7	28

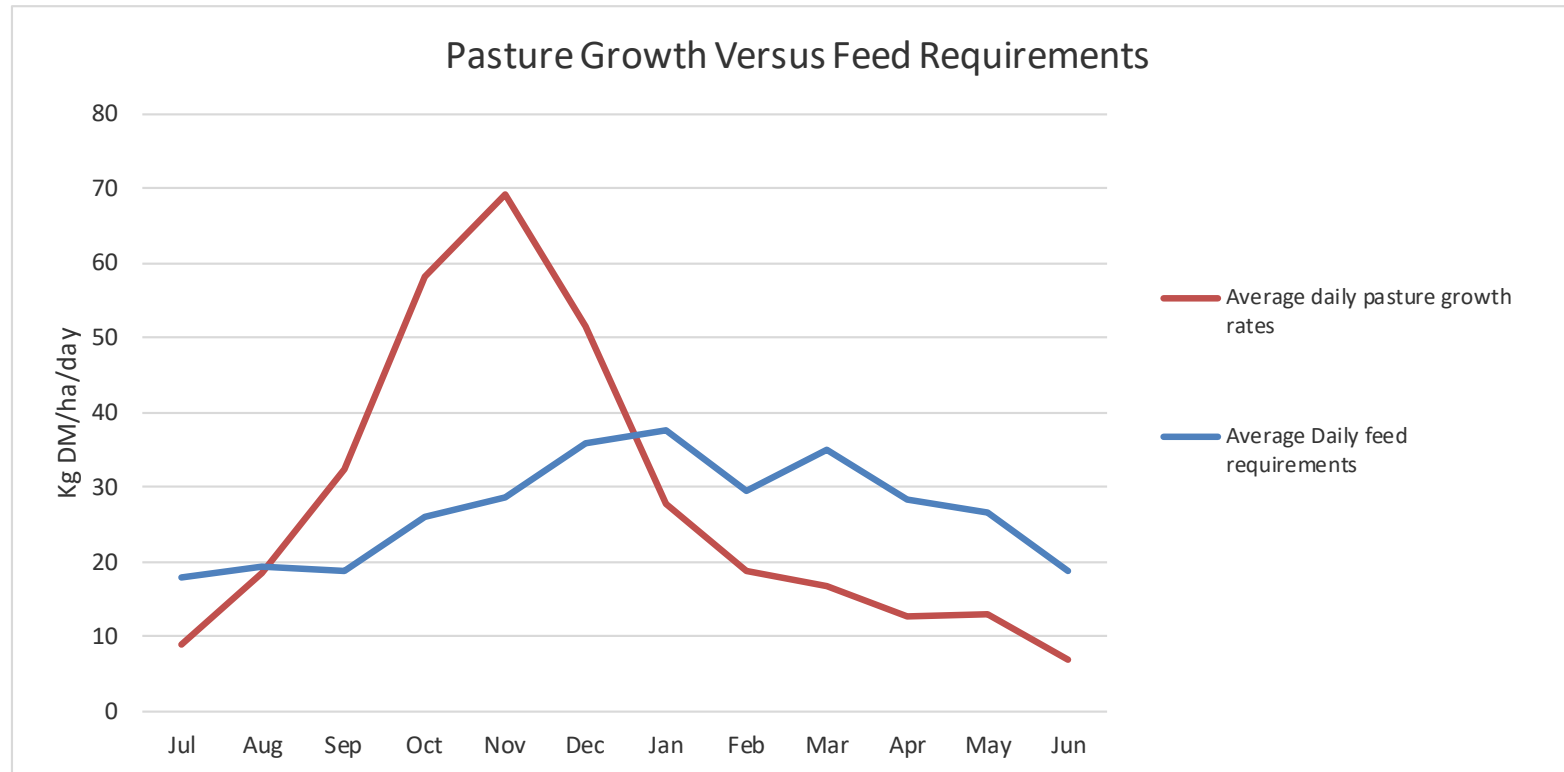
Animal Demand		Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	
Animal numbers														
Cows and calves	Number													
Dry Cows	Number	0												
Heifer/Steer Calves	Number					73	73	473	873	873	800	800	800	
Heifers (12-24 mth)	Number	429	429	429	429	429	429	429	429	429	429	429	429	
Steers (12-24 mth)	Number					249	249	150	150	150				
Bull calves	Number													
Bulls (12-24 mth)	Number													
Bulls (Mature)	Number													
Ewes (Dry)	Number				1,500	1,500	1,500	7,100	7,100	7,100	7,100	7,100	7,100	
Ewes and lambs	Number				5,600	5,600	5,600							
Lambs weaned	Number						1,200	10,200	6,200	6,200	6,200	6,200	6,200	
Ewe lambs (6-12 months)	Number	1,500	1,500	1,500										
Wethers	Number													
Rams	Number	150	150	150	150	150	150	180	180	150	150	150	150	
Animal requirements														
Cows and calves	Intake/hd/day													
Dry Cows	Intake/hd/day													
Heifer/Steer Calves	Intake/hd/day					7.0	7.0	4.5	4.5	5.0	5.8	6.5	7.0	
Heifers (12-24 mth)	Intake/hd/day						8.5	8.5	8.5	9.7	10.9	12.1	12.0	
Steers (12-24 mth)	Intake/hd/day					10.5	10.5	10.5	10.5	10.5				
Bull calves	Intake/hd/day													
Bulls (12-24 mth)	Intake/hd/day													
Bulls (Mature)	Intake/hd/day													
Ewes (Dry)	Intake/hd/day	1.3	2.0	2.0	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	
Ewes and lambs	Intake/hd/day				3.8	3.8	3.8							
Lambs weaned	Intake/hd/day						1.7	1.7	1.8	2.0	2.0	2.0		
Ewe lambs (6-12 months)	Intake/hd/day						1.7	1.7	1.8	2.0	2.0	2.0	2.0	
Wethers	Intake/hd/day													
Rams	Intake/hd/day	2	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	
Total Requirement	kgDM/month	8,370.0	8,370.0	8,100.0	728,500.0	798,765.0	1,000,184.0	1,061,564.0	836,192.0	992,040.3	936,483.0	1,001,017.9	607,440.0	7,987,026
	kgDM/ha/day	0.3	0.3	0.3	26.1	28.6	35.8	37.5	29.6	35.1	33.1	35.8	21.7	24

Feed Status - summary

Month	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun		
SURPLUS/DEFICIT - NO SUPPLEMENTS														
	kgDM/month	236,342	507,860	868,788	895,570	1,074,604	441,508	-279,100	-357,916	-516,209	-590,971	-639,354	-419,200	1,221,922
	kgDM/ha/day	8	18	32	32	40	16	-10	-14	-18	-22	-23	-16	4
PASTURE COVER - NO SUPPLEMENTS														
Opening Balance	kgDM/ha	1,600	1,862	2,426	3,390	4,384	5,576	6,066	5,761	5,368	4,803	4,155	3,446	
Closing Balance	kgDM/ha	1,862	2,426	3,390	4,384	5,576	6,066	5,761	5,368	4,803	4,155	3,446	2,980	
Supplements														
Silage	kgDM/month	0	0	0	0	0	0	0	0	0	0	0	0	0
Hay	kgDM/month	0	0	0	0	0	0	0	0	0	0	0	0	0
Grass seed straw	kgDM/month	0	0	0	0	0	0	0	0	0	0	0	0	0
Grain	kgDM/month	0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrogen	kgDM/month	0	0	0	0	0	0	0	0	0	0	0	0	0
Forage Crop / Crop residue / stubble	kgDM/month	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	0	0	0	0	0	0	0	0	0	0	0
SURPLUS/DEFICIT - WITH SUPPLEMENTS														
	kgDM/month	236,342	507,860	868,788	895,570	1,074,604	441,508	-279,100	-357,916	-516,209	-590,971	-639,354	-419,200	1,221,922
	kgDM/ha/day	8	18	32	32	40	16	-10	-14	-18	-22	-23	-16	4
PASTURE COVER - WITH SUPPLEMENTS														
Opening Balance	kgDM/ha/day	1,600	1,862	2,426	3,390	4,384	5,576	6,066	5,761	5,368	4,803	4,155	3,446	
Closing Balance	kgDM/ha/day	1,862	2,426	3,390	4,384	5,576	6,066	5,761	5,368	4,803	4,155	3,446	2,980	
ACTUAL														
Actual closing balance	kgDM/ha/day	1,600	262	2,164	1,226	3,157	2,419	3,647	2,113	3,255	1,547	2,608	838	
Difference to budgeted closing balance	kgDM/ha/day	262	2,164	1,226	3,157	2,419	3,647	2,113	3,255	1,547	2,608	838	2,142	

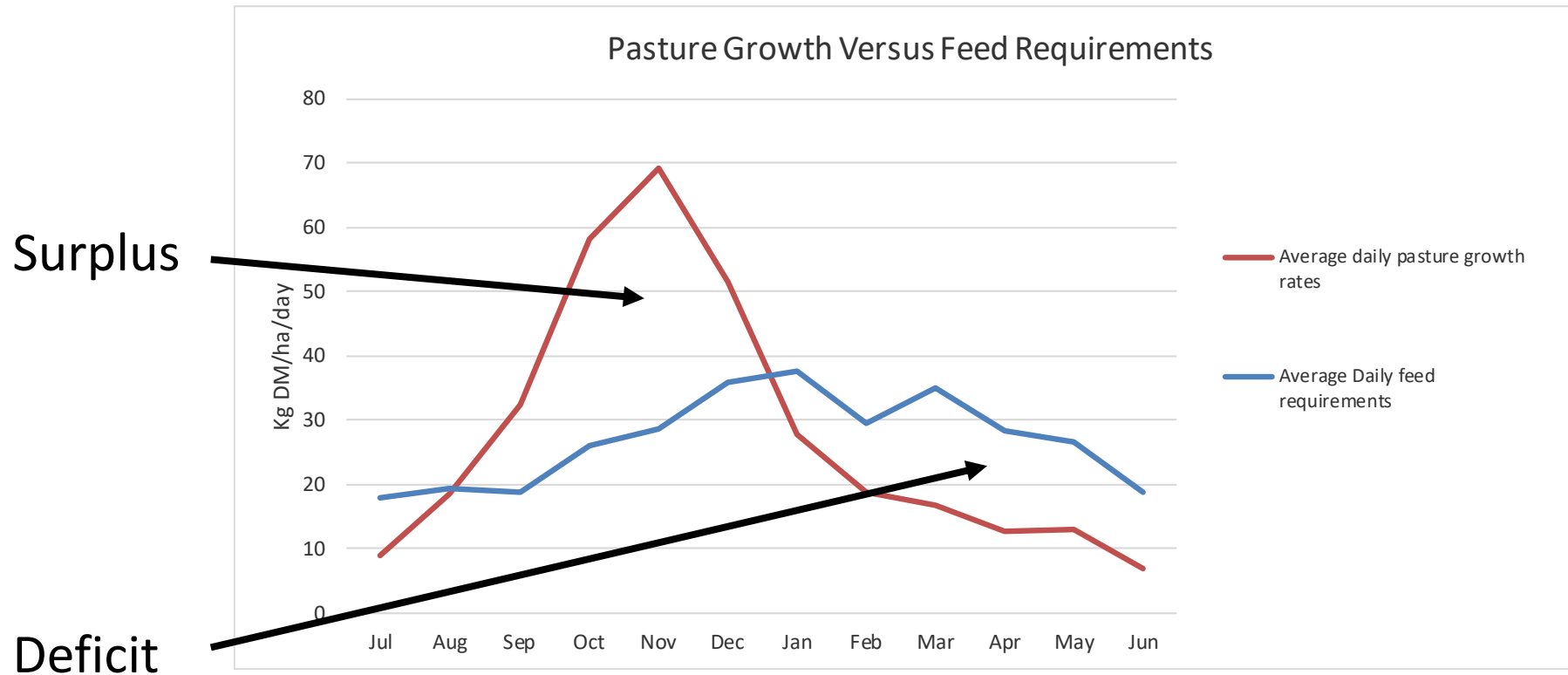
Seasonal Feed Budgets

- The annual feed profile;



Seasonal Feed Budgets

- The annual feed profile;



Take Home Messages

- Paddock and seasonal feed budgeting to support short, medium and long term feeding decisions
- “Monitor to manage”
 - Measure/calculate available feed
 - Knowledge and understanding of animal feed requirements
- Proactively manage your feed situation rather than be reactive
- Plenty of feed budget tools available for use

How – Feed budget tools

- Many feed budget tools are available;
 - www.makingmorefromsheep.com.au/efficient-pastoral-production-tool_12.14.htm
 - DSE rating tool plus much more
 - www.evergraze.com.au/tools/#feedbudgets
 - Include paddock level and seasonal feed budgets plus much more
 - www.lifetimewool.com.au/tools/FBTgreen.aspx
 - www.macquariefranklin.com.au/wp-content/uploads/2016/01/Grazing-Management-Tools_V1.1
 - Brassica forage crop feed budget

Carrying Capacity, Stocking Rate & Feed Budgeting

It's Ewe Time, Campbell Town 12th June 2019

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