

# **ACHIEVING HIGH PERFORMANCE FROM A RANGE OF FARM SYSTEMS IN SOUTHLAND**

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## **Summary**

- A range of farming systems exist in New Zealand.
- Dexcel has characterised five production systems ranging from an all-grass, self-contained system to high input split-calving systems.
- Choice of system depends on goals, attitude, skills, available resources, and environmental and regulatory considerations.
- Production and financial benchmarks are described that result in high performance in each system.
- The key performance indicators to achieve this high performance are different for different dairy systems.
- Best practice management to achieve production and financial targets is discussed.

## **Introduction**

The last 15 years has seen a wide range of dairy production systems evolve in New Zealand. This has occurred because each farmer has their own definition of success, set of values, skills, knowledge and aspirations, and have different resources available to them.

During this time there has been much debate comparing the relative merits of each system. Comparisons have usually been made on a milksolids per ha or milksolids per cow basis, and have typically been confounded by differences in managerial ability of the operators. These measures have proved to be less than useful as a fair evaluation of the ability of the different systems to generate high profits and return on assets.

A more useful approach is to ask what are the key production and financial targets that must be met for each system to achieve high performance i.e. “best practice” for each production system. This paper sets out to describe the different farm systems in this way so that farmers can meaningfully benchmark their performance against relevant systems, and identify opportunities to improve profitability. It also provides guidelines on management practices within each of the systems which can be used to achieve the key performance indicators (KPI).

## **The five farm production systems**

New Zealand pastoral farming is about balancing feed supply and demand profitably, so it is logical to group production systems by allocation of feed. The range of farming practices has been characterised into five different production systems, primarily described on the basis of when supplementary feed is used during the season (Figure 1).

The targets represent best practice and are based on what the best farmers are doing, and on results from farm systems research. Farmers, consultants and researchers have been involved in the process to ensure the figures are robust.

These systems have been characterised for a number of regions throughout New Zealand – this paper only shows the KPIs, financial returns, and assets for a 175 ha farm in the Southland region, which is non-irrigated, high quality dairying land, that is growing 16.5 t pasture DM/ha (Tables 1 and 2).

Clearly there are many different variations of these systems being operated throughout New Zealand, however these five systems provide a basis for broad comparison, and the principles and key drivers of profitability should be universally applicable.

### ***System 1***

An all-grass self-contained dairy system. No feed is imported onto the farm i.e. no supplement is fed to the herd except supplement harvested off the effective milking area, and the herd is not grazed off from the effective milking area. This system is not applicable to Southland.

### ***System 2***

Feed is imported into the system (either supplement or grazing off) for dry cows. Approximately 4-14% of total feed is imported onto the farm – the amount will vary depending on the amount of feed required for dry cows e.g. in Southland this system uses 12% imported feed. For farms growing 16.5 t DM/ha in Southland, stocking rate is 3.1 cows/ha (CSR of 83 kg LW/t DM), and production is 1240 kg MS/ha and 398 kg MS/cow from a 265-day lactation. Return on asset is 5.8% and EFS is \$2,070/ha (Table 1 and 2).

### ***System 3***

Feed is imported to extend lactation (typically autumn feed) and for dry cows. Approximately 10-20% of total feed is imported onto the farm, with some regions like Westland using the feed to extend lactation in spring rather than autumn. In Southland this system uses 19% imported feed. For farms growing 16.5 t DM/ha in Southland, stocking rate is 3.4 cows/ha (CSR

of 81 kg LW/t DM), and production is 1411 kg MS/ha and 421 kg MS/cow from a 275-day lactation. Return on asset is 5.8% and EFS is \$2,168/ha (Table 1 and 2).

#### **System 4**

Feed is imported and used at both ends of lactation and for dry cows. Approximately 20-30% of total feed is imported onto the farm. In Southland this system uses 27% imported feed. For farms growing 16.5 t DM/ha in Southland, stocking rate is 3.5 cows/ha (CSR of 80 kg LW/t DM), and production is 1648 kg MS/ha and 469 kg MS/cow from a 290-day lactation. Return on asset is 5.3% and EFS is \$2,152/ha (Table 1 and 2).

#### **System 5**

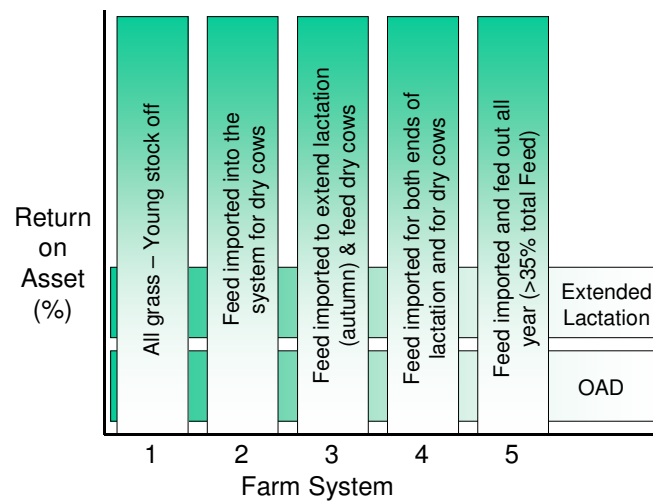
Feed is imported and used all year throughout lactation and for dry cows. Approximately 30-40% of total feed is imported onto the farm, but this can be up to 55% imported feed. Split calving is common in this system. In Southland this system uses 37% imported feed. For farms growing 16.5 t DM/ha in Southland, stocking rate is 3.8 cows/ha (CSR of 80 kg LW/t DM), and production is 2000 kg MS/ha and 521 kg MS/cow from a 305-day lactation. Return on asset is 4.9% and EFS is \$2,152/ha (Table 1 and 2).

All the systems are based on having young stock grazing off the effective milking area.

By defining production systems based on when imported feed is used, farm systems can be compared from Southland through to Northland. For example, a farm wintering off in Southland may import 12% of feed compared to a farm in Northland wintering off, importing only 6% of feed.

Grouping systems by feed is one dimension of the farm system. Equally farm systems can be grouped around alternative animal systems such as once-a-day milking (OAD), by calving interval (extended lactation), or by organic or forage cropping system (Figure 1).

Based on Dexcel Profitwatch information (2000-2002), 41% of New Zealand dairy farmers operate System 1, 31% operate System 2, 17% operate System 3, and 11% operate System 4, and 1% operates System 5, with a trend toward more intensive systems being evident.



**Figure 1:** Production systems grouped by feed and animal systems

## Selecting a production system

High performance can be achieved from a range of farm systems. Selection of the farm system best suited for a farm depends on:

- Your measures of a successful farm system
- Your access to resources either on or off farm
- Attitudes (to risk, environment, feeding cows), skills and knowledge of the people involved
- Environmental considerations
- Regulatory constraints

Many farmers are driven by a need to be challenged or by production goals. It is important that you know what you want to achieve personally, both now and in the long term, as often a current production goal or a farm system may not allow you to meet your long term goal.

Every farm system needs to be sustainable i.e:

- Profitable
- Repeatable i.e. able to produce consistent results over time
- Practical and functional for the owner and farm staff i.e. hours worked, daily tasks, enjoyable
- Not damaging to the environment or animals

The information in Tables 1 and 2 show the KPIs needed to maximise return on asset within the Southland region. It tells three important messages.

- All systems require high levels of management and performance to achieve high profitability – lower per cow production does not mean poor management, simply that it has performance targets that are appropriate for that particular cost structure. However, high levels of production do need to be achieved within a given cost structure (production system). Per cow production ranges from 398 kg MS/cow on the all-grass/wintering off System 2 to 521 kg MS/cow on the high input system. These would be considered to be good levels of production within each of these systems. While this production is important to achieve the required income, they should be considered along with the other important KPI's that drive each system, and the goals of the individual.
- When farmed to best practice and when the KPI's for each system are being achieved, all systems can be profitable and give reasonable returns at current cost and prices. Level of risk and type of skills required will be different across the systems. It would generally be regarded that the higher input systems can provide more consistent production, but may be more complex to manage. Risk in these systems may be higher if variability in feed prices is not controlled, as profitability is very sensitive to milk and feed prices fluctuations.
- Based on top performance and present costs and prices, a similar return on asset (within 1%) can be extracted from all four pasture-based dairy systems in Southland. Compared to higher input systems sourcing supplement at 24-24.5 cents/kg DM, the lower input systems can achieve a higher RoA. High input systems need to target a higher income to offset higher input costs. A higher EFS also needs to be achieved to give a similar return on asset, as these systems require more fixed capital investment in improvements (feedpads, dairy, and housing), dairy company shares, stock, plant and machinery. If supplement can be secured at 24-24.5 cents/kg DM, System 4 and 5 can deliver good RoA. If supplement costs are less than these high input systems can give RoA comparable to, or better, than Systems 2 and 3. The price of supplement used in System 2, 3, 4, and 5 was 21.5, 22, 24, and 24.5 cents/kg DM, respectively (Table 2). Using a more expensive supplement (or if supplement wastage is greater than 20%) will quickly lower EFS and RoA. For example, if supplement price increased by 1.5 cents/kg DM (to 23 cents/kg DM in System 3, 25 cents/kg DM in System 4, and 26 cents/kg DM in System 5), RoA decreases by 0.1%, in System 3, 0.2% in System 4, and by 0.4% in System 5 (Table 2).

Clearly, as milk price, input costs and capital costs change, there will be a financial advantage to different systems. The higher input systems will be more sensitive to these changes than lower input systems.

Before changing your farm system consider the resources available to you and, most importantly, whether that system meets the needs of the farming business and your own personal goals. In order to achieve the same return on asset, different systems require different levels of profit as they employ different amounts of labour and capital (cows, shares, plant and machinery and land).

## **Optimising your production system**

The management practices for getting high performance out of pasture-based seasonal dairy systems are summarised in Table 3. Optimising farm systems in these areas will improve overall business performance. In addition, the following principles are core to managing profitable dairy farms in New Zealand.

### ***Business management***

- Minimal capital outlay for any farm system
- Excellent cost control for all systems
- Pasture eaten (MJME/ha or kg DM/ha) is a key driver of profit for all farm systems i.e. pasture grown x pasture utilisation
- Every farm and farmer is unique
- A well implemented, sub optimal system will outperform a poorly implemented system optimal system
- No one system is best
- More complex systems are more difficult to optimise, duplicate or expand.

### ***Farm policy***

- Select farm system to best meet resources, attitudes, goals, environmental considerations and regulatory constraints.
- Dry matter and energy intake are the main drivers of production except for systems feeding more than 35% imported feed where protein, starch and fibre need to be considered.
- Pasture grown and quality
- Identify factors restricting pasture production; drainage, fertility, climate, topography, species, management.
- Renovate poor performing pastures only after correcting the cause of poor performance.
- Renovate with novel (e.g. AR1) or low endophyte as appropriate for regions for milk production gains.

- Manage out poor performing pasture.

### ***Stocking rate***

- There is a tension between pasture harvested and cow efficiency. Research has shown a CSR of 80-90 kg Lwt/t DM is the optimal stocking rate where pasture harvested and cow efficiency maximises profit. Use kg MS/kg Lwt (or % of Lwt) for a measure of cow efficiency.
- The optimal CSR is heavily influenced by marginal costs associated with more/less cows which are specific to an individual farm. More cows will harvest more grass, but at a cost.

### ***Calving date – planned start of calving (PSC)***

- All systems to get peak cow numbers and intake to coincide with peak pasture growth rates.
- Systems not feeding supplement in the spring (cows only returning to milking platform at or close to calving) calve 60-70 days before feed supply = feed demand (balance date).
- For other systems use a feed budget to determine planned start of calving.

### ***Cow type***

- All systems need high breeding worth (BW) cows as these cows are selected on traits that are profitable for seasonal pasture-based systems.
- The liveweight of the cow is a consequence of the system and breeding. Therefore systems feeding largely all grass (System 1-3) cow liveweights are up to 500 kg cow, for System 4 around 500 - 530 kg and System 5 cows are often 550 kg plus as a result of higher feed intake (lower CSR) and also because these systems usually run larger dairy cow breeds.

### ***Breeding policy***

- Systems 1-3
  - Target herd BW - NZ herd average or higher
  - High breeding values for fertility and body condition important for easy to manage systems. Select breeding sires for high positives in these traits from sires with high production traits.
- Systems 4-5
  - Target herd BW to be in the top 25% of NZ herd BW as high BW cows continue to respond at higher supplement inputs.

- Seasonal supply – High breeding values for production traits and fertility. Select breeding sires for high positives in these traits from sires with high production traits.
- Split calving - High breeding values for production traits. Select for sires with positive fertility BV from those with the highest production trait.

### *Management*

Height measurements referred to below are compressed height on Rising Plate meter (RPM; kg DM/ha based on RPM formula of “height x 140 + 500”).

- Measurement of pasture on a regular basis and cow condition at strategic times is critical to excellent implementation of any farm policy.
- Implementation of a farm policy starts in February.
- Provide an allowance of herbage and supplements to meet cow energy intake i.e. the longest pasture provides sufficient intake to meet cow intake needs. Fully feeding cows does not maximise profit. Feed cows to meet production targets for the farm system only, no more, no less.
- Average Pasture Cover (APC) should be no less than feed cover required at “balance date” so as not to limit potential pasture growth.

### *Key times to achieve target APC*

- Balance date i.e. when feed supply equals feed demand
- Calving - calculated backwards from target using a feed budget
- Mating - to meet peak intake
- After mating, APC to be kept in window of 2000 – 2200 kg DM/ha
- Average Pasture Cover at Balance date =  $(\text{Cows calved/ha} \times \text{pasture intake/cow} \times \text{rotation length})/2 + \text{target residual kg DM/ha}$
- (Where target residual = 1500 kg DM/ha, and where pasture intake + supplement intake is 80-90% of peak intake).
- Feed cover needs to be a wedge with the longest paddock at target pre-grazing cover (determined by a feed budget) and the shortest paddock recently grazed.
- Graze to a consistent residual. Cows will not graze lower than the previous grazing without compromising production.
  - For example the Lincoln University Farm which is irrigated and with low endophyte ryegrasses graze consistently to 3.5 cm (7 clicks on RPM). This residual is suitable for nil or novel endophyte ryegrasses not prone to summer dry in the South Island.

- Where cows leave higher residuals the target residuals can be restored by:
  - Forcing cows to clean up, accepting milk production will be affected
  - Mechanical means
  - However, when the residuals are re-established there will be a lag in pasture growth.
- Grazing rotation length should be closely related to pasture growth rates i.e. when growth rates are low use a longer grazing rotation, when growth rates are high use a faster grazing rotation. The rotation to be sped up or slowed down in anticipation of high or low pasture growth, respectively.
- Cow management must be consistent - cow training i.e. 12 hr; 24 hr; or cows going back into a paddock to clean up.

#### *Cows*

- 70% of cows to be calved by 4 weeks
- Cow condition targets
  - Herd average at calving CS 5.0 (90% cows > CS 4.5 & < CS 6.0)
  - Heifers & second calvers CS 5.5
  - 4-6 weeks before mating CS 4.0 or better and gaining weight
  - Cows < CS 4.0 calved for 6 weeks require attention to get above 4.0 for mating.
- Replacements must meet target liveweights to prevent milking feed being diverted to liveweight gain i.e.
  - 30% mature Lwt at 6 months
  - 60% mature Lwt at 15 months (mating)
  - 90% mature Lwt at 22 months

#### *Supplements*

- The primary use of supplements is to increase cow milking days per hectare, either through an increase in stocking rate, extending lactation at either end of the lactation or a combination of both.
- Supplements used to increase per cow per day production will generally give much lower response rates.
- Decisions to feed out supplements should be based on maintaining residuals and not rotation length.

## **Strategic use of supplement (year round use of supplement)**

- Imported feed to cost on average for the season no more than 5% of payout (cents/kg DM) or 0.5% on energy basis (cents/MJME); may need protein source if summer dry. May pay more for a high value component such as protein to make a ration work providing the average seasonal cost is maintained.
- CSR 80-90
- Achieve grazing residuals as detailed above
- Quality supplement i.e. > 10.5 MJME
- Achieve 80% plus utilisation of supplements
- System set up to minimise operating costs for minimal capital outlay.

## **Tactical use of supplements can give returns as follows:**

The following outlines when supplementary feeding is profitable and when feeding out of supplements should stop.

- Winter – responses of 100 g MS/kg DM where spared winter pasture eaten by milking cows; break even feed price inclusive of all costs (supplement + harvest+ cartage + feed out costs + return on capital invested, generally 10 cents/kg DM plus) at a payout of \$4.00 is 40 cents/kg DM. Therefore can afford to pay up to 6% of payout for winter grazing as fewer costs associated with grazing off.
- Spring
  - Cows restricted moderately (under fed) i.e. grazing residuals 1300 – 1450 kg DM/ha (6 clicks on RPM) - milksolids response up to 60 g MS/kg DM supplement fed.
  - Cows severely restricted grazing residuals < 1300 kg DM/ha (5 clicks or lower on RPM) get carry over response lifting milksolids response to supplement up to 145 g MS/kg DM supplement.
  - Using supplements to allow an earlier calving date or increased stocking rate is the most reliable approach.
- Summer and Autumn
  - Poor short term responses of 30 g MS/kg DM fed, only profitable where able to get high carry over benefits from increasing days in milk (DIM).
  - Responses of up to 120 g MS/kg DM where significant increases in DIM are achieved.

### *Environmental Sustainability*

- Nitrate leaching is an inevitable consequence of dairy farming mainly through cow urine. Systems with no N and no supplements can leach 25 kg N/ha. This amount increases as cows per ha and supplementary feed supplied per ha increase. Nitrogen, calcium, phosphate, potassium, sulphur and magnesium application to be calculated from nutrient budgets. Pay particular attention to effluent disposal areas.
- The current key problem is that the acceptable level of nitrate leaching has not been defined yet.
- Up to 400 kg N/ha will get an economic response providing the CSR is 80–90. However, high levels are unlikely to meet regional council standards for nitrogen applications.

### **Benchmarks relevant to your farm**

The benchmarks provided in this paper provide a guide to high performance. Next season additional tools will be available that allow easy calculation of these benchmarks for your farm (Profit Doctor software) and comparison with relevant farm systems around the country and within your region (Dairy Base). Dairy Base is an industry owned national database that over time will have the physical and financial performance information from a large proportion of New Zealand dairy farms. Ask your accountant, advisor or Consulting Officer for more information.

### **Conclusions**

The production and financial benchmarks for different dairy systems provided in this paper allow meaningful comparison between different production systems and also allow opportunities for improved performance to be identified. Best management practices are detailed which can be used to achieve these targets.

## Tables

**Table 1:** Key performance indicators for 4 best-practice pasture-based dairy systems in the Southland region growing 16.5 t pasture DM/ha

	<b>System 2</b>	<b>System 3</b>	<b>System 4</b>	<b>System 5</b>
<b>System Description and KPIs</b>	<b>Purchase feed for wintering either on or off</b>	<b>Purchase feed to extend lactation and winter either on or off</b>	<b>Purchase feed for both ends of lactation &amp; wintering</b>	<b>Purchase feed all year</b>

Production (kg MS/ha)	1,240	1,411	1,648	2,000
CSR (kg Lwt/t DM)	83	81	80	80
% of feed allowance purchased	12%	19%	27%	37%
Feed allowance (t DM/cow)	5.9	6.0	6.5	7.0
Cows per hectare	3.1	3.4	3.5	3.8
Liveweight (kg Lwt/ha)	1526	1644	1827	2150
Liveweight (kg/cow)	490	490	520	560
Production (kg MS/cow)	398	421	469	521
Production (MS as a % of Lwt)	81	86	90	93
Pasture grown (t DM/ha) <sup>1</sup>	16.5	16.7	16.9	17.3
Pasture quality (MJME/kg DM)	11.5	11.5	11.5	11.5
Pasture utilisation (%)	78	79	80	80
Supplements (t DM/ha) <sup>2</sup>	2.28	4.02	6.40	10.1
Total pasture eaten/ha t DM	12.9	13.2	13.5	13.8
Purchased supplement (kg DM/cow)	733	1197	1822	2632

Table 1 (contd)

	System 2	System 3	System 4	System 5
System Description and KPIs	Purchase feed for wintering either on or off	Purchase feed to extend lactation and winter either on or off	Purchase feed for both ends of lactation & wintering	Purchase feed all year
Feed eaten (kg DM/kg MS)	11.7	11.7	11.7	11.6
Feed offered (kg DM/kg MS)	15.1	14.7	14.1	13.7
Production from feed offered (g MS/kg DM)	66	68	71	73
Cows spring calving (%)	100	100	100	100
Lactation (days/cow)	265	275	290	305
Lactation (days/ha)	825	922	1019	1171
Average kg MS/cow/day	1.50	1.53	1.62	1.71
Replacement rate (%)	22%	22%	22%	22%
Cows milked per person	175	170	150	130
People for a 175 ha farm	3.1	3.5	4.1	5.2
Herd size for a 175 ha Farm	545	587	615	672

<sup>1</sup>Includes 200 kg N fertiliser/ha

<sup>2</sup>Includes ten weeks in winter when cows are grazed off the farm. Supplement use based on 80% utilisation of pasture silage and 70% utilisation of winter grazing.

**Table 2:** Financial returns for 4 best-practice pasture-based dairy systems in the Southland region growing 16.5 t pasture DM/ha

Cost and returns/ha	System 2	System 3	System 4	System 5
Milksolids income @ \$4/kg MS	4,960	5,644	6,592	8,000
Net stock income	334	360	432	496
Total income	5,294	6,004	7,024	8,496
Farm working expenses				
Labour	861	935	1,199	1,470
Animal health & additives	125	151	193	307
Herd improvement	103	111	116	127
Farm dairy	50	52	53	58
Electricity shed	90	101	109	123
Supplements made on farm	79	60	0	0
Supplements purchased <i>see below</i>	512	906	1,560	2,502
Grazing off (young stock)	291	313	346	387
Fertiliser (incl. N)	445	442	426	365
Crop and regressing	30	30	30	30
Freight	20	23	25	30
Weed & pest	10	10	10	10
Repair & Maintenance	160	165	175	185
Vehicles	120	155	175	215
Administration	52	52	61	66
Standing charges	102	105	107	111

Other expenses	10	10	10	10
Depreciation based on IRD rates	164	215	277	348
Total Operating Expenses	3,224	3,836	4,872	6,344
Operating expenses \$/kg MS	\$2.60	\$2.72	\$2.96	\$3.17
Operating profit (EFS)	2,070	2,168	2,152	2,152

Table 2 (contd)

Cost and returns/ha	System 2	System 3	System 4	System 5
Return on Asset (RoA)	5.8%	5.8%	5.3%	4.9%
Operating expenses excl. labour \$/kg MS	\$1.91	\$2.06	\$2.23	\$2.44
<b>Supplement price</b> average cents/kg DM	21.5	22.0	24.0	24.5
If supplement price increased to 23 cents System 3; 25 cents System 4; 26 cents System 5				
EFS \$/ha		2,124	2,083	1,999
RoA %		5.7%	5.1%	4.5%
<b>Assets (\$/ha)</b>				
Land, buildings and irrigation	23,000	23,000	23,000	23,000
Additional improvements <sup>1</sup>	225	467	1,583	2,500
Shares & peak notes	7,961	9,016	10,366	11,980
Land, shares & improvements	31,186	32,483	34,949	37,480
Stock	3,666	3,948	4,351	4,988
Plant & machinery	914	1,029	1,314	1,686
Total assets	35,766	37,460	40,614	44,154

<sup>1</sup>Improvements compared to System 2: System 3 (dairy and housing costs, feedpad, upgraded effluent system); System 4 (larger feedpad, storage and bunkers, extra housing for extra staff, extra dairy costs, upgraded effluent system); System 5 (larger feedpad, storage and bunkers, more extra housing, extra dairy costs, more invested in effluent system compared to System 4).

**Table 3:** Management practices for achieving high performance in a range of farm systems

	System 1	System 2	System 3	System 4	System 5
<b>FARM POLICY</b>					
Stocking Rate	85-90	80-90	80-90	80-85	80-85
CSR kg Lwt/t DM					
From trial work the most profitable stocking rate is in a CSR range of 80–90. The range is narrowed for the 5 production systems as higher input systems optimise profit at a lower stocking rate.					
kg MS/kg LWT					
- Northland	0.70-0.80	0.70-0.80	0.75-0.80	0.80-0.85	0.85-0.90
- Waikato, BOP, Taranaki ,LNI, unirrigated SI	0.70-0.80	0.75-0.80	0.80-0.85	0.85-0.90	0.90-1.00
- Irrigated Canterbury & Southland	0.80-0.90	0.80-0.90	0.85-0.95	0.90-1.00	0.95-1.00+
Planned Start of Calving (PSC)					
Balance Date: When feed supply = feed demand	55-60 days before Balance date	60-70 days before Balance date	60-70 days before Balance date	Calving date & rate to result in peak cow intake coinciding with peak growth	Calving date & rate to result in peak cow intake coinciding with peak growth
Pugging	No pugging damage				

	System 1	System 2	System 3	System 4	System 5
Spring management					

	System 1	System 2	System 3	System 4	System 5
Minimum Average Pasture Cover all season kg DM/ha	APC > 1800	APC > 1800	APC > 1800	APC > 1900	APC > 1900
APC at calving <sup>1</sup> kg DM/ha	2200 – 2400	2200 – 2400	2200 – 2400	APC > 2000	APC > 2000
APC at Calving Southland & Canterbury <sup>2</sup> Kg DM/ha	2000 - 2300	2000 – 2300	2000 - 2300		
Note <sup>1</sup> for some hill farms, farms with poorer quality pasture species and farms at risk of snow in the spring, the APC target may be a combination of pasture and supplement					
Note <sup>2</sup> Excludes supplement, actual pasture cover only					
APC at Balance date kg DM/ha	1850 – 1950	1850 – 1950	1850 – 1950	1950-2000	1950-2000
APC Mating to March keep in the window of kg DM/ha (excludes paddocks closed for supplement)	2000 – 2200	2000 – 2200	2000 – 2200	2000 – 2200	2000 – 2200
Shape of feed cover at calving	Wedge	Wedge	Wedge	Wedge	Wedge
Nitrogen	As per farm policy – First application in spring up to 50 kg N/ha to 40-50% of farm at PSC, follow cows at up to 50 kg N/ha for balance of farm		As per farm policy		

	System 1	System 2	System 3	System 4	System 5
	<p>In spring where nitrogen is farm policy apply on weekly basis regardless of conditions except in very water logged soils or where soils will be damaged from application.</p>				

	System 1	System 2	System 3	System 4	System 5
First rotation	First round ~ 40 days				
Areas with moderate to good winter growth	Tools to allocate feed: Spring rotation planner (SRP)				
Areas with low winter growth and/or where cows come back to farm gradually as they are due to calve	Starting at 1/80 <sup>th</sup> farm down to 1/20 <sup>th</sup> – 1/23 <sup>rd</sup> at balance date or feed budget				
Grazing residuals for milking cows – compressed height as measured by Rising Platometer (RPM)	Starting at 1/100 <sup>th</sup> farm down to 1/20 <sup>th</sup> – 1/23 <sup>rd</sup> (reliable spring growth) or 1/23 <sup>rd</sup> - 1/25 <sup>th</sup> (subject to variable spring growth, cold fronts eg Southland) at balance date or feed budget				
Residuals - Dry matter Irrigated DM/ha (relevant to most of Southland)	3.5 – 4.0cm (7-8 clicks)	3.5 – 4.0cm (7-8 clicks)	3.5 – 4.0cm (7-8 clicks)	3.5 – 4.0cm (7-8 clicks)	3.5 – 4.0cm (7-8 clicks)
Residuals - Dry matter Non irrigated, prone to summer dry kg DM/ha	1500 kg DM/ha (based on platometer equation x 140 + 500)				
Surplus management	Actual drymatter (kg DM/ha) based on platometer equations for non-irrigated pasture				
	April – Sept 1450-1600; Oct 1650-1800; Nov 1850-1950; Dec 2200-2300; Jan 2400-2550; Feb 2500-2650; March 2300-2450				

When to close for silage	<b>System 1</b>	<b>System 2</b>	<b>System 3</b>	<b>System 4</b>	<b>System 5</b>
	<p>Paddocks taken out of round as soon as pre-grazing cover exceeds target – check feed wedge graph</p> <p>Target pre-grazing = (cows/ha x dry matter intake (DMI) x rotation length days) + target residual. It is too late to drop paddocks when you can see 10% clumps.</p> <p>Recalculate target pre-grazing on new rotation length</p> <p>Supplement not harvested</p>				

	System 1	System 2	System 3	System 4	System 5
Area of farm to close	% of farm to harvest = demand kg DM/ha/day (cows/ha x intake) ÷ pasture growth rate				
Length of time closure	Ideally make small light crops with paddocks out of the round for minimal time and no more than 40 days. Where large % of farm closed at one time, keep time out of round to minimum i.e. round length + 5-8 days				
Mowing height – RPM (compressed height)	4 cm or 8 clicks				
<b>Reproduction – mating management</b>					
Cow condition score (CS) at calving	90% of MA cows CS 4.5 or better; heifers CS 5.5			All cows CS 5.0-5.5	
4 weeks before mating check cow condition	Cows less than CS 4.0 and calved for 6 weeks require preferential treatment				
Mating	Cows gaining weight				
Calving Spread	Max 10 week	Max 10 week	Max 10 week	6 week mating for split calving autumn; 8 week spring	
<b>Summer</b>					

	<b>System 1</b>	<b>System 2</b>	<b>System 3</b>	<b>System 4</b>	<b>System 5</b>
Round length Summer dry i.e. where expected pasture growth rates 1 January to 31 March <80% of herd requirements	Slow rotation to 30-35 days by 1 January When rain does come, if summer moisture deficit exceeds 250 ml 1 Nov – 28 February, daily grazing area should not exceed 1/35 <sup>th</sup> of the total farm area	Purchase feed available for summer round as per late spring 20-28 days	Round as per late spring 20-28 days		
Wet or irrigated	Rotation length as for late spring 20-25 days				
Culling Summer dry aim to have sufficient cows to harvest pasture when rain does come Good summer growth keep culling to non performers only	Empty & cull cows (to a max 20% of herd) removed when average DMI of herd is <10 kg DM/cow/day	Minimal culling to have sufficient cows to convert supplement & autumn grown pasture to milk	Cull low producers only		
Option to use of OAD to match feed supply to demand in summer/autumn	Farms prone to summer dry OAD suitable for whole herd	OAD younger cows TAD rest of herd	All cows TAD		
<b>Autumn/Winter</b>					



	System 1	System 2	System 3	System 4	System 5
Drying off - Production	Dry off individual cows with daily MS < 0.5 kg MS/cow/day for 2 consecutive weeks. Once 50% herd dried off, dry remainder of herd off			Production (as per systems 1-3) & 40-60 days from calving	Dry off cows 40-60 days from calving
Round length			When herd feed requirements are greater than winter pasture growth rates May – July daily grazing area should be no greater than 1/30 <sup>th</sup> , 1/40 <sup>th</sup> , 1/50 <sup>th</sup> and 1/100 <sup>th</sup> of the total farm area during March, April, May & June, respectively Critical to have a wedge of feed at start of calving. Achieved by extending round in late lactation with daily grazing area no greater than 1/40 <sup>th</sup> and 1/45 <sup>th</sup> of the total farm area during April and May respectively. Where pasture cover in May is > 2000 kg DM/ha there is the opportunity to graze some cows at home, maintaining/creating the feed wedge.	Feed budget to keep APC > 1800 kg DM/ha and meet cover at calving targets	
Southland			When winter pasture growth rates exceed herd feed requirements May – July daily grazing area should be no greater than 1/20 <sup>th</sup> , 1/30 <sup>th</sup> , 1/40 <sup>th</sup> and 1/60 <sup>th</sup> of the total farm area during March, April, May & June, respectively		

	System 1	System 2	System 3	System 4	System 5
Stand off area/pad	May need a stand off pad to achieve no pugging			Yes	Yes
Feed bins etc.	No	No	No if possible	Yes	Yes
<b>Strategic use of supplements</b>					

	<b>System 1</b>	<b>System 2</b>	<b>System 3</b>	<b>System 4</b>	<b>System 5</b>
Why supplement is used		Carry more cows through winter to milk for the rest of the season	Increase cow numbers and cows days in milk	To further increase cow numbers and cow milking days	Significantly increase cow numbers, milking days & supply out of season milk
Timing		Winter	Extend lactation	Autumn, winter, spring	All year
Response to supplement		100 g MS/kg DM+ 9.5 g MS/MJME+	75-100 g MS/kgDM 7.1-9.5 gMS/MJME	75-100 g MS/kgDM 7.1-9.5 gMS/MJME	50-75 g MS/kg DM 4.8-7.1 gMS/MJME
Type of supplement needed		DM/Energy	DM/energy, minerals	DM/energy, minerals, check protein in summer	DM/energy, Minerals, protein, check fibre, soluble sugars & starch
Diet balancing		DM/energy	ME 10.5+ MJME/kg DM minerals	ME 10.5+ MJME/kg DM Minimum protein 18% early, 16%	ME 10.5+ MJME/kg DM Minimum protein 18% early, 16%

	System 1	System 2	System 3	System 4	System 5
				mid, 14% late lactation, 12% dry minerals	mid, 14% late lactation, 12% dry Min. fibre (NDF) 30-35% Min. effective fibre 20% of NDF Max. nonstructural carbohydrate 38% Max. starch 26% Max. added fat 3% unprotected, 3% protected Minerals
Spring					
Cows moderately restricted (under fed) Grazing residuals 1300-1400 kg DM/ha (6 clicks RPM)			Milksolids response up to 60 g MS/kgDM supplement fed		

	System 1	System 2	System 3	System 4	System 5
Cows severely restricted, grazing residuals <1300 kg DM/ha ( 5 clicks RPM)	Milksolids response up to 145 g MS/kgDM supplement fed				
Cows fed maintenance only, grazing residuals <1200 kg DM/ha ( 4.5 clicks RPM)	Milksolids response up to 175 g MS/kgDM supplement fed				
Summer & Autumn Only feed supplement surplus to requirements i.e. have sufficient supplement to feedout when it rains and for winter	Poor short term responses of 30 g MS/kg DM. Supplement should not be fed to increase daily per cow production but to increase days in milk (DIM). Where DIM are increased significantly can get up to 120 g MS/kg DM				

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