

## Swan Inlet visit and presentation, April 2016:

### Pasture restoration through Semi-Intensive Rotational Grazing

Visit lead by Andrez Short, Swan Inlet Farm.

Attending: Frin Ross (FC), Esther Bertram (FC), Sally Poncet (Island Land Care), Adam Dawes (DoA), Trish Eats (DoA), Sue Street (DoA), Reggitze Petersen (DoA).

Notes prepared by: Frin Ross, Andrez and Alison Short, Sally Poncet.

Andrez and Alison Short ran Swan Inlet Farm (273 ha) for 14 years, from 2002 to 2016. During their time on the farm, they developed a semi-intensive rotational grazing programme that quadrupled farm production and resulted in significant restoration of pastures and native plant communities. Andrez gave a presentation to FC and DoA staff on 12th April followed by a farm visit on the 19th April. Andrez has kept meticulous quantitative records of the Swan Inlet grazing regime and weather in a bespoke database. This report is mainly a summary of Andrez' observations on pasture management and restoration, with some references to the associated livestock management system. It is based on detailed day-to-day observation and precise data.

#### Background

- The property at Swan Inlet was bought from FIDC in 2002. The camp had been traditionally set stocked and burned, although in the 10 years prior to Andrez' tenure, it had been grazed by horses with some areas rotavated for reseeds.
- The farm covers 273 ha and is the smallest farming unit in the Falklands; for a few years, up to 150 ha of adjacent land was leased from FLH.
- When they started at Swan Inlet, Andrez and Alison had no farm or pasture management background and ran the property as a riding school. However, they also started looking at different ways of managing their land and they weren't afraid to ask questions, being open to new ideas and prepared to give them a go.
- Their aim was to cover costs (i.e. it was not to be a 'hobby farm'). In the 14 years they went from an annual loss of £20, 000 (due to a lot of capital investment) to a small profit. This showed that, with better land management, family run farms do not need to be so big and can turn a healthy profit without causing detriment to the land.
- In 2003 Andrez attended a week long "Grazing for Profit" course run by Sean Martin. This and Hugh Munro's report (*Munro, H. 1924 Report of an investigation into the conditions and practice of sheep farming in The Falkland Islands, London. Waterlow and Sons Ltd. 57pp*) shaped his subsequent approach to pasture management.
- Though Hugh Munro's report is almost 100 years old a number of his primary recommendations remain relevant, yet until recently few of his pasture management recommendations were adopted. Munro predicted widespread land degradation across the Falklands, with ensuing declines in stock carrying capacity and soil quality.
- Andrez's approach was to pay careful attention to the condition of *both* the pastures and the livestock because each must be at their best if a farm is to realise its potential. He believes in working with plants and livestock that thrive in the Falklands environment rather than those that require other conditions (e.g. fertilizer). On large farms this might be achieved by identifying separate staff members to lead pasture and livestock management, including record keeping.

- Detailed record keeping is important if you want to measure performance and monitor progress. Andrez measured the number of sheep and cattle in paddocks at any one time in Dry Sheep Equivalents (DSE). One DSE is equivalent to a 45 kg dry (i.e. non-breeding) sheep eating 7.6 mega joules a day to sustain itself. By this reckoning, for example, a 60 kg 130 day pregnant ewe equals 1.96 DSE, a 50 kg lactating ewe with twins equals 3.3 DSE and a 30 kg hogget equals 1.25 DSE.
- Andrez recorded the length of time stock were held in a paddock, monthly rainfall and soil temperature in a database designed with Nikki Buxton. Wool weights and micron, body condition and weight were also recorded in other software.

### **Grazing management**

- Andrez' approach to the situation (with areas of the Falklands in "free-fall" in terms of soil and plant degradation) was to reject set-stocking and instead develop a system of high intensity (livestock density) short-term grazing ('hoof and tooth') adapted to the size of Swan Inlet Farm and to conditions at Swan Inlet.
- The 273 ha were divided in 150 paddocks using 2 and 3 strand electric fences. Paddocks ranged from 0.37 to 5.05 ha, and averaged 1.74 ha.
- First consideration when subdividing was water and 'like pasture with like pasture'. 150 paddocks were needed to provide sufficient individual areas for the separate seven sheep bloodlines to continue to be rotated during mating (See farm plan, Figure).
- Over time, experience showed that it took 75 DSE/ha for 3 days, for example, or 225 DSE/ha for one day to initiate a change in pasture. The changes include an increase in vegetation height and in the number of plant species and their abundance.
- The frequency with which animals were moved between paddocks, was dictated by season and the state of the pasture (height, quality and abundance of grasses): which Andrez gauged by eye and experience.

In summer small mobs were moved relatively quickly around paddocks (spending roughly two days in each paddock), and were only allowed to graze the tops off the grasses: this allowed plants to maximise their growth in the growing season. It also enabled the farm to "store" feed for the winter (in the form of long grass), eliminating the need for hay (Figures 3 and 4).

In the winter mobs were combined (e.g. to be up to four times the size of summer mobs) and moved more slowly between paddocks (at approximately four day intervals). The pasture could also be grazed very low to the ground: because plants are not growing their annual productivity is not affected by heavy winter grazing. However, it remains important to rotate mobs though the winter: to ensure that their food ration is spread across the winter period, and that they graze less palatable species at the same time as the most nutritious ones (this is helpful for animal's digestion and pasture condition).

- Management of rotation (e.g. speed and paddock selection) was also adjusted according the needs of a mob. It was always ensured that pregnant or lactating ewes had access to decent pasture.
- Stock were sometimes used to "move" nutrients between paddocks by grazing a lush paddock during the day and moving the mob to an impoverished area e.g. a clay bank for the night, before being returned to good grass the next morning.

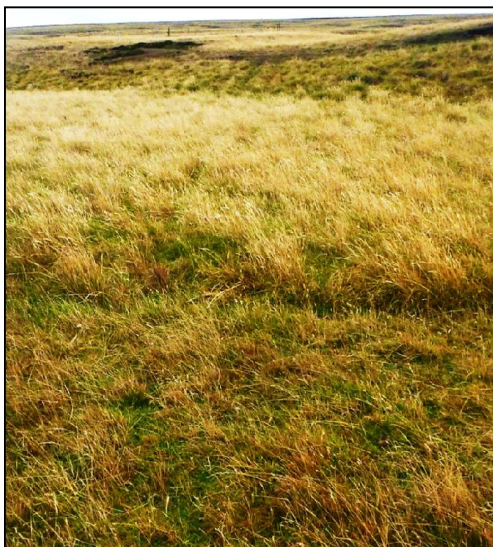
- The sheep quickly became accustomed to being moved between paddocks; they learnt that being moved meant a fresh feed of good quality grasses. Andrez also found that “tame sheep can be held with a piece of string” because if they are not hungry i.e. if there is enough grass, they have no need to look for food outside the fence: paddocks could therefore be fenced economically.  
Andrez also learned that it is not vital to gather every last sheep at the cost of “stressing” vulnerable animals (e.g. pregnant ewes or those with young lambs), a few stragglers would not damage a paddock and could be left or gathered at a more convenient time. In the early days (before sheep were accustomed to frequent moving) he devised methods which enabled mobs to move to new paddocks without potentially harmful exertion: for example leaving gates open for a couple of days or even cutting small sections of fencing.
- Larger farms running more livestock and larger mobs could use larger paddocks: the important point is that any form of camp rotation or spelling paddocks is better than none. When others have ‘tried and failed’ with rotating it appears anecdotally that they have had too few sheep in a camp for too long a period.
- Having learnt in the Grazing for Profit course that grass starts growing later than the traditional lambing period in the Falklands, Andrez altered the timing of his lambing so that it coincided with the period of maximum plant growth and optimum pasture condition. He lambed in November, which is nearly a month later than the Falklands average, and reckons that in some years it would be even better to lamb in late December/January.
- Swan Inlet lamb weights were consistently above the Falklands average, as were weaning weights and hogget survival (see outcomes below).
- Cattle and sheep were rotated separately through the paddocks with a least a 3 week interval between them. This allowed sheep to “hoover” up the cattle parasites and vice versa, which resulted in lower species-specific parasite loads (and therefore less anthelmintics used).
- Cattle are useful for improving pasture because they graze roughage such as white grass which they are able to digest. The cattle were forced to graze thin strips (using electric fencing to divide the paddocks into temporary subunits), which meant that they could not afford to be selective about which plants they ate – they ate everything, before being moved on to the next strip. This resulted in a very efficient use of pasture and quadrupling of the number of days stock could graze an area.
- Andrez thinks that a ratio of 50:50 cattle to sheep (in DSE equivalent units) would have provided the maximum benefit to pastures and livestock.
- One of Andrez’s definitions of pasture management is that it should provide sufficient nourishment to grow and finish cattle and sheep to abattoir-standard condition without having to rely on reseed for fattening.
- The system operates on similar principles to holistic management, except that Andrez runs his cattle and sheep separately while holistic farming runs them together. He closely monitored his livestock and adjusted their food (pasture) availability when necessary.

### Pasture management

- Conventional wisdom suggests that a successful regime of stock rotation is one that prevents grass from setting seed. This was not always possible at Swan Inlet. Although they tried to keep the pasture at 'phase 2' (the phase of good growth – Figures 3 and 4) during the summer, the short growing season meant that grass quickly ran to seed. However, when pastures set seed it did not appear to produce lesser amounts of feed for sheep and enabled diverse grass types to establish and spread.
- Paddocks were completely grazed in the winter – using them in effect to store feed.
- Rotational grazing resulted in an increase in the quantity and depth of roots for each plant and created leaf litter. The build-up of dead leaves and organic matter was viewed as a positive process because the layer of leaf litter reduces evapo-transpiration by protecting plants and earth from the drying effects of wind and sun.
- Activities that damage the vegetation and soil were avoided whenever possible: initially a few very small, strictly controlled burns were carried out and rotavation minimised. Although the burning had been used as a 'tool', it quickly became apparent that no burning of any description was necessary: burning is detrimental because it removes plant nutrients in the soil, established plants and seeds. It also makes land very vulnerable to erosion.
- Areas which had been burned or rotavated (for reseeding) in the past were dealt with in a number of ways to try and restore some productivity. Initially areas of bare and poor ground which had been disturbed in the past were reseeded. Some burnt areas could be restored with rotational grazing alone but all historic reseeds and areas which had been severely burnt needed continual fertilizing or they very quickly became unproductive.

Restoration of some old reseeds was helped initially by direct drilling with lotus and mixed grasses, which persisted for a couple of years before dying out. Direct drilling lotus and clovers in strips into mown whitegrass was more successful than rotavating and then sowing, because the vegetative surface stayed intact and protected the seedlings. The lotus encouraged sheep out into the flats and the increase in protein in the sheep's diet enabled them to consume some of the lignified whitegrass at the same time.

Impoverished areas (old reseeds and burn sites) are common across the Falklands and can be very difficult to manage economically for grazing. Recovery options might include strict grazing management such as very short spell high intensity grazing (perhaps with seeding) followed by long spelling periods, or intervention such as seeding with palatable species (e.g. Yorkshire fog or native grasses) by direct drilling.



This photograph illustrates the long-term benefits of direct drilling into a mowed sward of white grass (long grass at the top of picture) compared to planting after ploughing and rotavating (as was done in the area of shorter grasses in the foreground).

This area was planted with clover, lotus and fescues in 2004. In both areas the introduced species were subsequently grazed out but where the white grass sward remained intact the pasture retained its structure and was more productive in the long-term.

- At the end of the day, the livestock management records showed that undisturbed areas managed by intensive rotational grazing were more economic than any reseeds. This can be difficult to appreciate because re-seeds appear green and productive and the costs of intervention (including time and fertilizer) are not always apparent. Their records show that reseeds and growing forage were not economic e.g. in one case study it cost £100 to produce oats for cattle with a payback of only £80 when all factors were considered.
- Habitat restoration is a long-term project: it took 10 years for the pastures at Swan Inlet to show a dramatic improvement. Plants in most paddocks then had strong root stocks, and leaf litter had begun to accumulate enabling them to sustain grazing without the need for chemical fertilizer or other intervention.
- This regime was initially done with just sheep, but, when cattle were introduced later on, Andrez found that they were better than sheep at improving pastures because they grazed differently. The cattle take longer grass and don't leave it so short. They are able to consume more of the dead, unpalatable whitegrass - opening up the underlying pasture to light. Traditionally, lignified grasses are removed by burning but of course this also destroys the green palatable grasses underneath
- Grazing management was used to improve eroded or reseeded areas through hoof action and defecation.
- Ground temperatures of 4-6 °C were observed to be the minimum required for growth of Yorkshire Fog Grass which was the main forage species.
- It is possible to manage grazing to benefit the plant species you want to encourage e.g. for forage or the conservation of particular native plants. This is achieved by ensuring that the preferred species is not grazed below *phase 2* during the summer.
- Tall bogs of white grass provide roughage for animals and shelter to help other native plants to establish. Also, geese do not like eating in long grass so geese numbers are reduced compared to reseeded areas.





Areas which had been burnt or reseeded in the past had low productivity and were very slow to recover.

Top left: small white grass bogs re-establish in a camp burnt over 20 years ago and now managed by rotational grazing.

Top right: a historic reseed which requires on-going fertilization to support grazing.

Bottom left: Christmas bush and other native species including fescues slowly colonising a historic reseed previously characterised by bare ground and erosion.

### Recording

- Livestock details (e.g. body weight, body condition, fleece weight, micron, yield etc.) were recorded; a process called 'bench-marking'.
- Stock movements were recorded to the nearest half hour (by paddock number). This level of precision was required because of the relatively small flock size, – larger farms could use a much coarser time scale.
- Rainfall and temperatures (including ground temperature to 5-10 cm depth) were measured monthly. This showed a three year cycle in rainfall. Between 2002-03 and 2014-15, average summer rainfall was 200 ml. Rainfall was measured only once a month (not daily) in a cumulative rain gauge (Figure 2).
- All results (e.g. profit, wool or meat output) were standardised to DSE per 100 mm of rainfall. Only summer rainfall (1<sup>st</sup> October-31<sup>st</sup> of April) was taken into account because rain at this time of year is a critical factor determining plant growth, – unlike the higher rainfall winter months, when the soil is likely to be fully saturated with water and much is lost as runoff.

- Timing of lambing (via date of tupping) could have been adjusted according to the predicted feed available at the end of winter, based on the summer growth data. However, this was never needed and tupping generally started on Liberation Day (June 14).
- These records allowed easy calculation of paddock productivity. It allowed overall income to be divided proportionally between each paddock according to the number of DSE each contributed to whole farm production. This in turn identified poorly performing paddocks, which might benefit from alternative management.
- These records have been collected for 10 years, enabling trends to be examined in detail. There are over 6000 real-time animal movement records.

### **Other**

- Experiments with growing crops for market showed that 1-2 inches of topsoil was lost per year to wind erosion in areas that were cultivated. Erosion was minimised in 2 ways: when creating a new crop field, the ground was rotavated and left to break up over the winter but not burnt. In spring (and all subsequent years), it was ploughed then rotavated again (very shallowly to prepare a seed bed), planted with oats. Work was carried out in as short a time as possible (i.e. the broken surface was exposed for less than ten days). The aim being to get plant cover quickly and minimise rotavation which damages the soil's structure.
- Another advantage of semi-intensive rotational grazing is that it results in taller grasses which are not favoured by upland geese compared to reseeded (which they target). Upland geese can graze pasture to a very short sward, and with two geese being equivalent to one DSE, they had to be routinely controlled (ca. 500 killed annually, the equivalent of 250 sheep) so that grass was available to sheep and not geese.
- For two years, the farm needed to carry well above normal numbers of ewes i.e. recipient ewes for embryo transfer programmes.  
On these occasions, forage crops (swedes) were planted and ewes strip grazed in late winter and early spring. Before grazing the forage crops the ewes were fed rape pellets (34% protein). This was to allow their rumens to process more lignified grass. Neither of these methods were used routinely. Generally, it was thought to be better to reduce stock numbers than to break up the surface of the soil and plant forage crops.
- Beetle larvae (known locally as 'grass grubs') killed Yorkshire Fog in some areas but were not deemed to be a problem as they did not persist and the areas eventually recovered.
- Plant diversity may be important for resilience to climate change.
- It's good to broadcast seed on bare ground early on a frosty morning as the ground then "closes" over the seeds.
- To enable farmers to work sustainably with the Falkland's environment it would be highly beneficial if a local market could be developed for three year grass-fed beef. This is a really good, tasty product worthy of premium prices.
- Ewes were shorn just before they lambed, using cover combs.
- Lambs were weaned at approximately 100 days of age. As birth dates were recorded for each lamb weaning weights were adjusted to the date of birth and then the lower 50% were culled. This is appropriate for a stud flock but not a breeding flock.
- Ewes were selected for dual purpose (meat and wool), and being able to lamb unassisted.





At Swan Inlet new plants quickly colonised areas where Yorkshire Fog has been killed by beetle larvae.

### Outcomes

- The carrying capacity, i.e. the total number of DSE on the farm, had risen from 0.36 to 2.56 DSE per hectare by 2016. This was due to pasture restoration and rotational grazing. (Carrying Capacity is dictated by the amount of feed available in the non-growing season.)
- Ewe lamb weights at 100 day weaning were 34 kg; ram lambs - 36 kg; "old season" lamb - 50 kg.
- Ewes lose only 2kg over the winter (compared with Falkland's average losses of 15 kg); average ewe weight was 55-75 kg compared to a Falklands average of 35 kg.
- Lambing was over 100%, lambs were strong and their survival to one year old was 100%.
- Lambs were 5-6 kg when born.
- Plant diversity increased with the appearance of native species such as mountain blue grass, fascine, orchids and pale maidens: plant diversity is good for animal nutrition, pasture resilience, and conservation.
- Inputs (fuel, fertilizer) were reduced, benefiting the environment: farming is more sustainable.
- Areas of eroded land are becoming vegetated.
- Profitability (from meat and wool) significantly increased.



Re-vegetation of an eroded bank through semi-intensive rotational grazing

Mountain blue grass growing along a fence line: a diverse sward is good for wildlife but can make driving tricky!





## Additional information

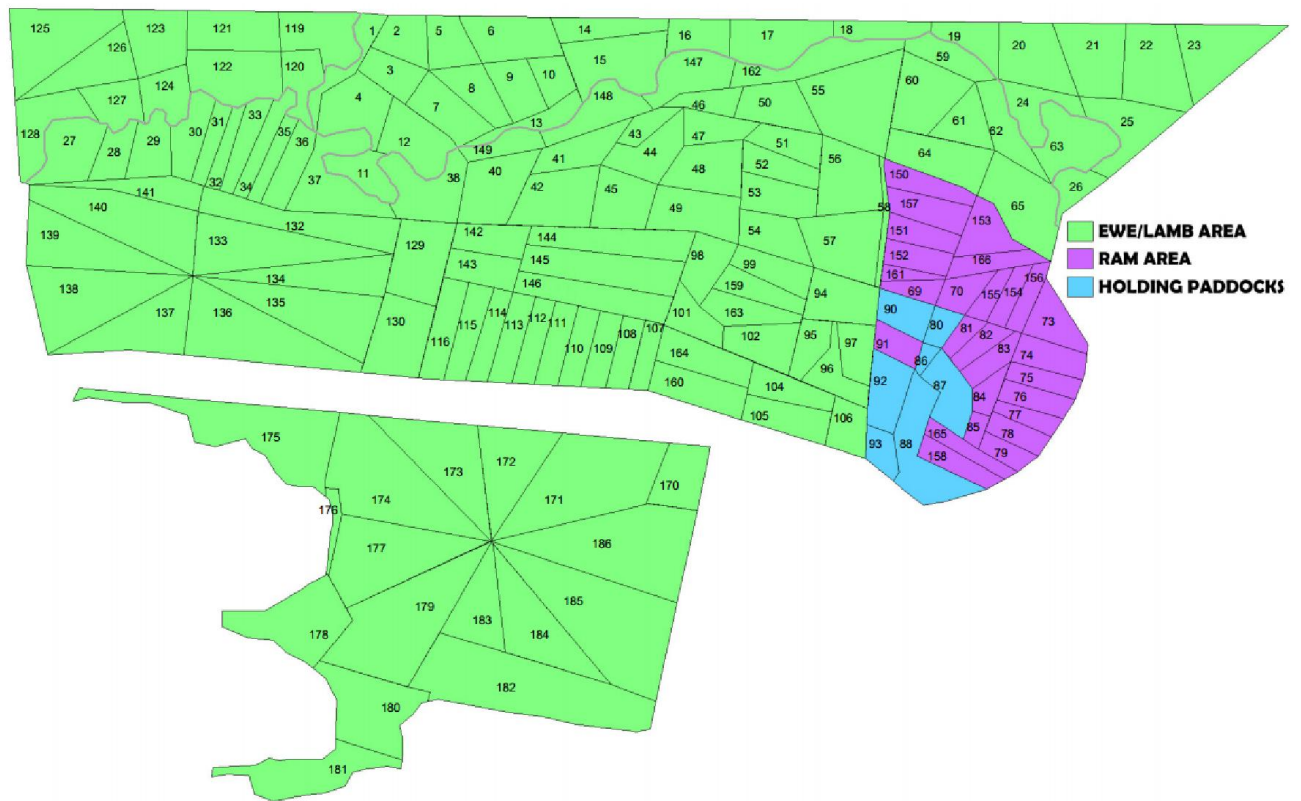


Figure 1. A map of Swan Inlet Farm showing how paddocks are divided. First consideration when subdividing was water and 'like pasture with like pasture'. 150 paddocks provided sufficient individual areas for the separate 7 sheep bloodlines to continue to be rotated during mating. The total area is 273 ha.

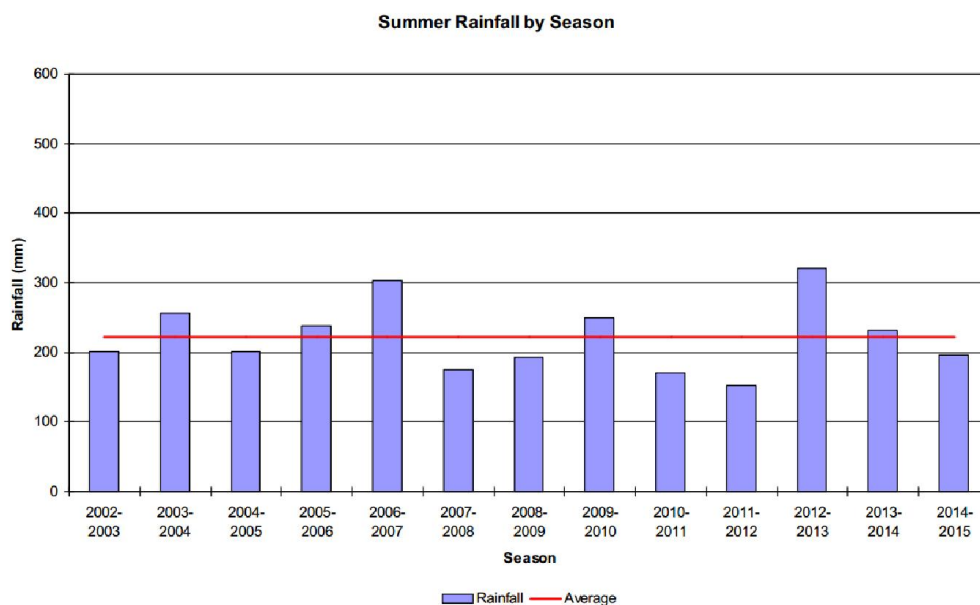


Figure 2. Rainfall was measured once a month this graph shows the total summer rainfall (1<sup>st</sup> October-31<sup>st</sup> of April) at Swan Inlet. Rain at this time of year is a critical factor determining plant growth.

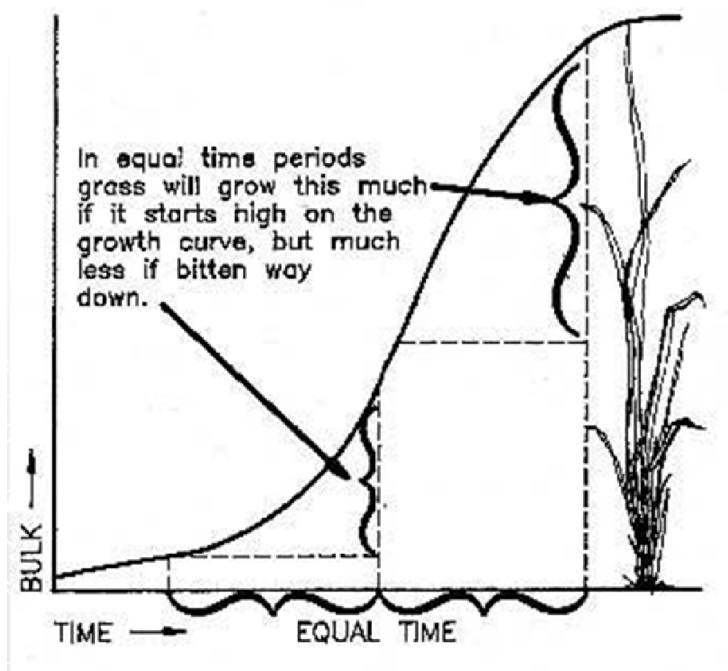


Figure 3. Grass growth curve showing the importance of maintaining plant height in a pasture during the summer growing season - referred to as 'Phase 2'.

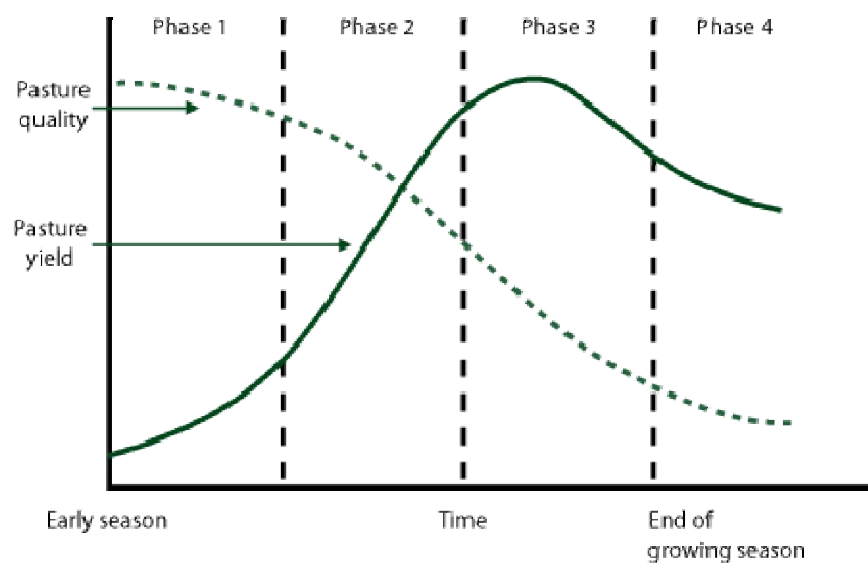


Figure 4. Pasture growth is usually described in three phases, followed by a fourth phase where pastures have 'hayed-off'. By understanding these phases, producers are better able to optimise pasture utilisation. This figure shows the changes in pasture quality and yield as pasture ages. Animal production can be increased by grazing pastures during phases 1 and 2 as quality is high. Quantity can, however, be limiting during phases 1 and 2 and animal intake may be constrained. Limiting grazing in early phase 1 will assist subsequent plant growth because continued grazing during this period will slow pasture growth and limit annual production. Conversely, pastures in phase 3 will yield well, but be of reduced quality (Meat & Livestock, Australia. 2015. Grazing and Pasture Management [www.mla.com.au](http://www.mla.com.au)).