



Heifer Nutrition from Weaning to First Calving

Updated: February 2006

AG0507

ISSN 1329-8062

John Moran, Kyabram

This Agriculture Note describes the importance of good nutrition when heifer rearing.

Introduction

Well grown heifers are a good investment to improve the milking herd. They produce more milk, get back in calf easier and last longer in the milking herd when compared to heifers that suffer growth checks during early life. Heifers are often located away from the prime grazing areas on the farm, such as on "runoff" blocks or on agistment, but it is important they are well managed. Otherwise many (up to 40%) may be culled before they reach maturity, even before they complete their first lactation.

Most changes in skeletal size occur before puberty. The onset of puberty, that is the commencement of cycling, is related to live weight rather than age. A delay in puberty means an increased chance of a later first conception, which disrupts future calving patterns.

All heifers should reach minimum live weights before mating, as lighter animals have lower conception rates and more calving difficulties. Mating Friesians weighing less than 260 kg, or Jerseys less than 200 kg, will lead to more calving difficulties. "Catch up" feeding after mating often results in heavier calves at birth, over-conditioned heifers and more calving problems, with little improvement in milk yield during the first lactation.

Assessing current heifer rearing practices

One good measure of how well heifers have been reared is their first lactation milk yield in relation to that of mature cows in the herd. Such information is readily available for farmers who routinely herd record their cows. This allows them to develop their optimum management systems for replacement stock for their particular lactation feeding program.

Over the last 5 years, the average herd of recorded Friesians in Victoria has first calvers producing at 80% of the milk yield of mature cows. If this value is 75% or less, heifer rearing practices should be reviewed to establish if they are contributing to their low production.

Targets live weights for growing heifers

Heifer milk production depends on their live weight at calving and how well they are fed and managed as milkers. Their optimum live weight at first calving depends on the milk yield farmers wish them to achieve at maturity in the herd. Table 1 presents data on target live weights (in-calf) for 2 year old Friesians heifers required to produce a subsequent full lactation yield as mature cows.

Table 1. Target live weights for 2 year old Friesian heifers to enable them to produce a specified milk yield as mature cows

Full lactation milk yield as mature cows (litres)	Target live weight as 2 year old heifers (kg)
3000	430
6000	540
9000	590

Once the target live weight as 2 year olds has been set, targets at younger ages can be determined. Current recommendations for ranges of live weights and wither heights of Friesian and Jersey heifers in Victoria are presented in Table 2. When setting such targets, farmers need to decide what levels of production they wish to achieve in their herd. It is important to realise that simply having bigger heifers at first calving will not necessarily increase their milk yields, in that their feeding should not constrain them from expressing their potential advantages. Additional feed costs must then be allowed for when making such decisions.

Wither height is a useful measure of bone growth and ultimate frame size, but not a good measure of live weight. Frame size determines the area between the pelvic bones, and hence the ease of calving. Wither height is measured as the highest point on the animal's shoulder, immediately above the front legs.

Nutrient requirements of growing heifers

For Friesians weighing 100 kg at 3 months to reach a target of 550 kg at calving as 2 year olds, they need to grow at 0.7 kg/day, compared to 0.5 kg/day if calving at 450 kg. Average weight for ages and the dry matter (DM)

intakes of good quality pasture (containing 10-11 MJ/kg DM of energy) required to achieve this are presented in Table 3.

Heifers require a high quality diet to grow at 0.7 kg/day. Table 4 presents the energy, protein, calcium and phosphorus concentrations of their diets to promote this rate of live weight gain.

Table 2. Target live weights (LWT) and wither heights (WH) for Friesian and Jersey heifers

Age (mth)		Friesian LWT (kg)	Friesian WH (cm)	Jersey LWT (kg)
2-3	Weaning	90-110	86-90	65-85
12	Yearling	250-300	116-120	190-230
15	Mating	300-360	120-124	240-275
24	Pre-calving	500-550	133-137	370-410

Table 3. Average weight for ages and DM intakes of heifers grown out to 450 or 550 kg as 2 year olds

Age range (mth)	450 kg @ 2 years old		550 kg @ 2 years old	
	Live weight (kg)	DM intake (kg/day)	Live weight (kg)	DM intake (kg/day)
3-6	125	3.0	132	3.4
6-9	175	3.8	196	4.6
9-12	225	4.7	260	5.8
12-15	275	5.6	324	7.2
15-18	325	6.6	388	8.6
18-21	375	7.6	452	10.4
21-24	425	11.6	516	13.7

Table 4. Dietary quality for heifers of different ages to grow at 0.7 kg/day

	3-6 m	6-12 m	>12 m
Energy (MJ/kg DM)	10.9	10.3	9.5
Crude protein (%)	16	12	12
Calcium (%)	0.52	0.41	0.29
Phosphorus (%)	0.31	0.30	0.23

Excess growth and "fatty udders"

There is a critical growth period when excessive live weight gains can increase the deposition of fatty tissue in the udder which reduces lifetime productivity. This is called the "fatty udder" syndrome. It is essential that heifers grow no faster than 0.7 kg/day between 6 and 12 months of age. Feeding large quantities of low protein cereal grains should also be avoided during this age range, because a deficiency of dietary protein can increase the rate of fatty tissue deposition in the developing udder.

Feeding heifers to achieve target growth rates

Grazing management should allow for continuous heifer growth throughout the first two years. Uniform growth is not necessary and may be impractical with fluctuating pasture availability. However, heifers should never lose weight or grow slowly for long periods during their first year, as they may not achieve their ultimate frame size and/or mating live weight by 15 months of age. Yearling

heifers can show some compensatory gain in their second spring following feed shortages the preceding winter.

Recommendations for grazing and feeding systems will vary with different regions. Rather than depend on "recipes", farmers should use target growth rates to plan optimum feeding strategies. To achieve 550 kg by 2 years of age, seasonal target growth rates can vary from say, 0.5 to 1.0 kg/day. The two most difficult periods to ensure acceptable growth in spring-born heifers are immediately after weaning and during their first winter.

Grazed pasture, being the cheapest feed available, should constitute the bulk of the diet. Rumen capacity in young heifers does not reach mature proportions until 5 or 6 months of age and, unless pasture quality is high (at least 10 MJ/kg DM of energy), feed intake and animal performance may be restricted by rumen capacity. The nutritive value of feeds tested by the FEEDTEST laboratory in Hamilton are presented in Table 5.

Farmers have traditionally relied on average quality pasture to rear their heifers, reserving the best quality pasture for their milkers. However, grazing management of heifers should be directed towards maximising pasture quality to ensure they consume sufficient energy and protein. Nevertheless, pasture-only diets may still not provide sufficient nutrients except for short periods of the year, for example during the spring flush of pasture growth. If heifers need to be fed conserved fodder to supplement limited pasture, it should also be good quality (9-10 MJ/kg DM of energy). Much of the pasture hay and silage made in Victoria is not this high in energy, so is unsuitable for heifers less than 12 months of age.

During periods of severe pasture shortages, grazing heifers may need to be fed up to 2 kg/head/day of cereal grain. Provided pasture protein levels are adequate (at least 16% protein), the cheapest and easiest grain to feed is whole oats, as it need not be rolled before feeding. Furthermore, the amount of starch in oats and its rate of release is the lowest of any of the cereal grains, making it the least likely to cause grain poisoning (acidosis).

Table 5. Nutritive values of pastures and supplements fed to growing heifers

	Dry matter (%)	Energy content (MJ/kg DM)		Protein content (%)	
	Mean	Mean	Range	Mean	Range
Grazed pastures					
Grass-based, immature	20	11	10-12	14	12-16
Grass-based, mature	35	7	5-9	6	3-8
Legume-based, immature	15	11	10-12	20	16-25
Legume-based, mature	30	8	5-10	12	10-15
Energy supplements					
Barley	90	13	12-13	11	7-15
Wheat	90	13	12-13	12	9-16
Oats	90	11	9-12	9	6-13
Maize	90	14	12-16	10	7-14
Protein supplements					
Lupins	90	13	12-13	32	28-36
Cottonseed meal	90	12	-	42	37-45
Urea	100	0	-	250	-
Forage supplements					
Lucerne hay	85	8	7-9	16	14-20
Grass-based hay	85	9	6-10	9	7-10
Grass-based silage	30	9	6-10	9	7-10
Maize silage	35	10	9-11	6	5-8

Table 6. Intakes of pasture dry matter and growth rates (in italics) in kg/day for heifers grazing various herbage masses of moderate quality pasture.

Age (m)	Live weight (kg)	Green herbage mass	Green herbage mass	Green herbage mass
		(kg DM/ha)	(kg DM/ha)	(kg DM/ha)
		1300	1800	2600
8	225	6.0 (0.7)	6.7 (1.0)	7.1 (1.2)
10	275	6.5 (0.6)	7.4 (0.8)	8.0 (1.1)
13	350	7.2 (0.4)	8.2 (0.7)	9.0 (0.9)
16	400	7.6 (0.3)	8.7 (0.6)	9.5 (0.9)
20	450	7.8 (0.3)	9.0 (0.5)	9.8 (0.8)

Grazing management of growing heifers

Pasture mass and quality are the two major factors influencing growth rates of grazing heifers. The main components of pasture quality are digestibility of green herbage, the amount of dead material and the proportion of

legume in the sward. Table 6 presents the effects of herbage mass of a moderate quality pasture (70% digestibility or 9.9 MJ/kg DM of energy, 15% legume, 25% dead pasture) on the predicted DM intakes and growth rates of heifers.

Low pasture mass (1300 kg DM/ha of green material) may suffice for very young heifers, but unless this is increased to 1800 or 2600 kg DM/ha in older heifers, supplementation will be required to achieve 0.7 kg/day live weight gain.

Short pastures require a longer grazing time to harvest the same quantity of dry matter. Cold wind and rain increase nutrient requirements, but more importantly, they reduce grazing time. This exaggerates the adverse effects of low pasture masses over winter and hence the increased need for supplements to maintain target growth rates and body temperature. Providing shelter belts in exposed paddocks will reduce the level of supplementation required.

Recommendations for control of Johne's Disease are that heifers younger than 12 months of age are excluded from pastures previously grazed by older stock. Separate paddocks must then be allocated for these younger animals. To ensure pastures remain good quality, they should be kept vegetative (comprising mainly green herbage with little dead material or seed heads) by removing any excess herbage as hay or silage.

The grazing management of yearling heifers can be planned to complement that of the milkers. To minimise the quantity of supplements required, heifers should be offered sufficient pasture of comparable quality (at least 10 MJ/kg DM of energy). They can be rotationally grazed ahead of, behind or independently of the milkers. Some farmers split their heifers into very small groups then set stock them in paddocks around the farm. However, pasture mass can rapidly diminish when animals are set stocked.

Younger or smaller heifers should be grazed separately from their heavier herd mates, on better quality and/or more pasture. They may require preferential supplementary feeding to achieve target live weights. This problem can be minimised by planning mating programs for compact calving, as it is usually the late calves that do not compete well.

Heifer growth rates are limited by inadequate water supplies, especially in summer with high temperatures and

dry, poor quality feed. Weaners require 25 L/day and yearlings require 45 L/day of water. Troughs should be placed where the maximum number of stock can drink simultaneously and not under fences or crossed by an electric fence. Water is a good conductor of electricity and cattle are extremely sensitive to even small voltages.

Management of heifers during late pregnancy

To minimise the risk of calving difficulties, heifers should grow no faster than 0.7 kg/day in their last few months of pregnancy and calve in condition score 5 or 6.

Underfeeding Friesian heifers during late pregnancy can increase the time between calving and first heat. Heifers take on average 2 weeks longer to commence cycling than older cows. This can be extended to 3 weeks if they are poorly fed during late pregnancy, as they will lose weight for a longer period during early lactation. This places them in negative energy balance for longer, thus delaying their first post-calving heat. Jersey heifers do not seem to be as adversely affected as Friesians by underfeeding during late pregnancy.

Further information

Agriculture Notes:

- Health and mating management of heifers from weaning to first calving
- Weighing and condition scoring of replacement heifers and dairy cows
- Contract rearing of dairy replacement heifers
- Feeding and calving pads for cows

John Moran (1993) Calf rearing - a guide to rearing calves in Australia, Melbourne: AgMedia.

The previous version of this note was published in December 2001.

The advice provided in this publication is intended as a source of information only. Always read the label before using any of the products mentioned. The State of Victoria and its employees do not guarantee that the publication is without flaw of any kind or is wholly appropriate for your particular purposes and therefore disclaims all liability for any error, loss or other consequence which may arise from you relying on any information in this publication.