



WATER

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In this Technical Note for MGA members, Mike Wilkinson discusses water requirements and factors affecting water intake by cattle. Mike can be contacted via the MGA office.

WATER

- **DRINKING WATER INTAKE INCREASES WITH:**
 - Diet dry matter content
 - Total feed intake
 - Age and weight of animal
 - Milk yield

- **CATTLE DRINK WATER RAPIDLY, OFTEN IN GROUPS**
 - Ensure adequate trough space
 - Water pressure can drop in times of drought
 - Check water quality regularly

Introduction

This note is about water requirements of cattle, water quality and managing water supplies. Water is a hot topic because England is currently suffering a prolonged drought. July 2022 was the driest month in England for 87 years, according to the Meteorological Office. Boreholes are drying up and maize crops are showing signs of drought stress. The drought will end, but nobody knows when.

Water is arguably more important than feed to sustain life, support growth and maintain lactation. Milk is 87% water and up to 81% of an animal's total body weight is water. Yet provision of adequate drinking water of high quality is often taken for granted until supplies are interrupted by a drought or burst pipes. Cattle sheds, loafing areas and grazing paddocks should have adequate access to drinking points with plenty of space around them, bearing in mind that cattle often drink in groups.

Water requirements of cattle

The water requirements of cattle increase with age and are considerably higher for lactating than for dry cows and young stock (Table 1). Total daily water intake of lactating cows is about 3 litres per litre of milk produced (NRC, 2001). Drinking water requirement increases with diet dry matter (DM) content, total DM intake and milk yield. Other factors affecting drinking water requirement include diet crude protein, diet sodium plus potassium concentration and daily mean ambient temperature.

Signs of excess water intake are diarrhoea, high urine production and bloated animals. The 'green waterfall' from the back ends of cattle grazed on wet spring pasture is an indication of high intake of water together with high levels of protein, sodium and potassium in grass.

Table 1. *Drinking water requirements of cattle of different ages* (based on Kononoff and Clark, 2017).

	Age	Drinking water requirement ¹ (litres/day)
Calves	1 month	5 to 7.5
	3 months	8 to 10.5
Heifers	5 months	14.5 to 17.5
	15 to 18 months	22.5 to 27
	18 to 24 months	27.5 to 36
Pregnant cows		30 to 50
Lactating cows		40 to 150

¹ Higher values apply to very dry diets >80% DM.

Signs of restricted water intake include frozen troughs and water pipes, low water pressure, a sudden drop in milk production, reduced or variable feed intake, rumens looking empty, faecal pats firm and dry, decreased urination, deep yellow urine, drinking from puddles (risk of bacterial toxicity) and urine drinking, which may also indicate acidosis. Stray voltage in excess of 0.5 volts can also reduce water consumption.

Table 2. *Effect of diet dry matter (DM) content on drinking water requirement of dairy cows.*

Diet DM (%)	Total DM intake (kg/day)	Total diet fresh weight intake (kg/day)	Involuntary water intake from diet (litres/day)	Total water required for 30 litres milk (litres/day)	Drinking water required (litres/day)
20	20	100	80	90	10
30	20	67	47	90	43
40	20	50	30	90	60
60	20	33	13	90	77

The effect of diet DM content on drinking water requirement is shown in Table 2 for a cow eating 20 kg DM/day, yielding 30 litres of milk/day and with a total water requirement of 90 litres/day. At low levels of diet DM, involuntary water intake from the diet is close to total water requirement. But as diet DM increases, so does drinking water requirement, from 10 litres a day at 20% total diet DM (e.g. grazed pasture) to almost 80 litres a day when a total mixed ration of 60% DM is being eaten.

Water quality

Annual water analysis is essential to confirm that supply is of acceptable quality and to identify potential hazards to animal health such as mineral deficiencies or toxicities and bacterial infections. Lack of water due to drought can prompt a switch to temporary sources, which may compromise quality.

Some water quality indicators are in Table 3.

Table 3. *Water quality indicators* (from NRC, 2001; Robillard et al., 2016, Kononoff and Clark, 2017).

Indicator	Acceptable limit	Indications and possible effects
pH	6.5 to 8.5	Low pH - dissolved metals, possible corrosion of pipes. High pH – water has slippery or soda taste
Total dissolved solids	500 mg/l	Dissolved minerals e.g. Fe, Mn, scaly deposits, water has salty bitter taste
Total coliform organisms	<10 coliforms/100 ml	Diarrhoea, hepatitis
Iron bacteria		Orange/brown slime in water
Cadmium	0.01 mg/l	Toxicity above 0.05 mg/l
Chlorides	250 mg/l	Water has salty taste, blackened steel
Copper	1.3 mg/l	Blue-green stains, bitter taste
Iron	0.3 mg/l	Water has metallic taste, yellow stains
Lead	0.05 mg/l	Liver toxicity above 0.1 mg/l
Manganese	0.05 mg/l	Water has bitter taste, black stains
Mercury	0.005 mg/l	Toxicity above 0.01 mg/l
Nitrates (NO ₃)	<45 mg/l	Toxicity at high levels (>133 mg/l), reproductive problems
Sulphates	250 mg/l	Water has greasy feel, diarrhoea

Managing water intake

Watering locations should be placed close to feed troughs and milking parlours, since livestock tend to alternate meals with drinking bouts. Recommended space is 10 cm water trough per cow with an optimum water trough height of 90 cm. At least 2 metres space should be available around water troughs to allow adequate animal access.

Shallow troughs, 8 to 20 cm depth, are preferable to deeper troughs because they are easier to clean (Figure 1). Cattle drop feed particles into water troughs when drinking and goldfish can be used in larger indoor troughs to keep them clean and prevent algal contamination. Cows prefer to drink warm rather than cold or hot water. It takes 7.5 MJ of energy a day for a cow to raise the temperature of cool drinking water to body temperature¹.

Figure 1. *Shallow water troughs* (from The Farming Forum, 2018)



Provision of shade and sprinklers help to reduce drinking water demand in periods of hot weather. Fans may increase water intake through greater evaporative loss of water through skin. Adding water to the diet during TMR mixing reduces dustiness and can relieve pressure on water troughs if access is limited. However, an additional 3 kg water per cow does relatively little to reduce total daily requirement for drinking water if the diet is relatively dry.

Individual cows can drink up to 15 litres of water a minute and adequate pressure is essential to prevent troughs from running dry. The UK legal minimum pressure in mains pipes to the boundary of private properties is 0.7 bar (Ofwat, 2017).

DM intake decreases as ambient temperature rises, especially when temperatures exceed 25°C. The reduction in feed consumption means that involuntary water intake from feed is also reduced. At the same time, total water requirement is increased to balance greater evaporative loss from the surface of the animal. Therefore, drinking water intake during heatwaves is likely to be considerably greater than normal. Adequate provision of water troughs is vital, especially at times when water pressure is likely to be reduced. Supplementary troughs may be advisable during periods of sustained hot weather.

¹ Specific heat capacity of water is 0.004185 MJ/°C/kg. Raising water temperature from 9 to 39°C = 30°C x 60 kg water drunk per day = 1800 x 0.004185 = 7.5 MJ/day.

Summary

Total water requirements of cattle increase with body weight and milk yield. Drinking water requirement increases with diet DM content. Multiple water troughs supplied with clean water at adequate pressure are essential around feed troughs and in fields. Shallow water troughs are preferred to deeper troughs because they are easier to keep clean. Annual water analysis is advisable to ensure supplies are of acceptable quality and to aid diagnosis of animal health issues.

References

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