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WATER REQUIREMENTS OF LIVESTOCK

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Providing enough quality water is essential for good livestock husbandry. Water makes up 80% of the blood, regulates body temperature and is vital for organ functions such as digestion, waste removal and the absorption of nutrients. Understanding daily livestock watering needs is key when designing a livestock watering system.

The daily water requirement of livestock varies significantly among animal species. The animal's size and growth stage will have a strong influence on daily water intake. Consumption rates can be affected by environmental and management factors. Air temperature, relative humidity and the level of animal exertion or production level are examples of these factors. The quality of the water, which includes temperature, salinity and impurities affecting taste and odour, will also have an effect. The water content of the animal's diet will influence its drinking habits. Feed with a relatively high moisture content decreases the quantity of drinking water required.

Given that drinking water needs are species-, farm- and management-specific, many producers today are opting to install water-metering equipment to obtain accurate measurements of water use. If medication is ever provided through the livestock's watering system, the meter can be used to ensure proper dose rates.

DAIRY CATTLE

Milk is composed of nearly 87% water. An adequate supply of quality water for dairy cattle is extremely important. Farmers typically provide cows with free access to fresh water at all times. The water requirements of lactating cows are closely related to milk production, moisture content in the feed and environmental factors such as air temperature and humidity. The cow's peak water intake generally occurs during the hours of greatest feed intake.

Table 1 identifies water use by major growth stage of dairy animal and breaks down the estimated water consumption of a milking cow by its level of milk production.

Table 1. Water Consumption by Dairy Cattle [(1), (2)]

Dairy Cattle Type	Level of Milk Production (kg milk/day)	Water Requirement Range[a] (L/day)	Average Typical Water Use[b] (L/day)
Dairy calves (1–4 months)	—	4.9–13.2	9
Dairy heifers (5–24 months)	—	14.4–36.3	25
Milking cows[c]	13.6	68–83	115
	22.7	87–102	
	36.3	114–136	
	45.5	132–155	
Dry cows[d]	—	34–49	41

[a] A result of the animals' environment and management.
[b] Typical consumption over a year on a daily basis under average agricultural conditions in Ontario.
[c] The average milk production in 2006 for a Holstein dairy cow in Ontario was 33 kg/day.
[d] Approximately 15% of the milking-age cows present on a dairy farm could be considered "dry."

BEEF CATTLE

Few studies have been undertaken to fully document water use by beef animals. Those that have been completed suggest that the water requirement of beef cattle is closely tied to whether the animals are lactating, the moisture content of their feed ration and environmental factors such as air temperature and relative humidity.

Grazing trials have demonstrated that weight gains of pastured beef animals are higher if a water supply is provided for the cattle in the grazing area, even though the animals are receiving a lot of water from their diet.

Table 2 provides average daily water requirements of beef cattle.

Table 2. Water Consumption by Beef Cattle [3]

Beef Cattle Type	Weight Range (kg)	Water Requirement Range[a] (L/day)	Average Typical Water Use[b] (L/day)
Feedlot cattle: Backgrounder	181–364 (400–800 lb)	15–40	25
Feedlot cattle: Short keep	364–636 (800–1,400 lb)	27–55	41
Lactating cows with calves	—	43–67	55
Dry cows, bred heifers & bulls	—	22–54	38

[a] A result of the animals' environment and management.
[b] Typical consumption over a year on a daily basis under average agricultural conditions in Ontario.

SWINE

The housing method, growth stage and feeding method used affect the drinking water requirements of pigs. Table 3 gives a breakdown of drinking water consumption by weight range or level of maturity.

Table 3. Water Consumption by Swine [4]

Swine Type	Weight Range (kg)	Water Requirement Range[a] (L/day)	Average Typical Water Use[b] (L/day)
Weaner	7–22	1.0–3.2	2.0
Feeder pig	23–36	3.2–4.5	4.5
	36–70	4.5–7.3	
	70–110	7.3–10	9
Gestating sow/boar	—	13.6–17.2	15
Lactating sow[c]	—	18.1–22.7	20

[a] A result of the animals' environment and management.
[b] Typical consumption over a year on a daily basis under average agricultural conditions in Ontario.
[c] Includes unweaned piglets.

The introduction of three-site production and all-in/all-out facilities has altered the water usage patterns and peak usage requirements of swine growout facilities. Pigs in the growing phase are often grouped in segregated rooms or entire barns by age. They are kept in this facility until the target weight is reached by the majority of animals, when the room or barn is emptied and then restocked.

Consider, for example, that five hundred 23-kg (50-lb) pigs at the start of a growout cycle will each consume 4.5 L/day. By the end of the growout cycle, the water requirements of these same 500 pigs, now weighing 100 kg (220 lb), will have doubled to 9 L/day each. The water system for these pigs must be designed for the higher value.

The use of wet/dry feeders and liquid feeding systems has reduced the volume of drinking water required because of the higher moisture content of the feed ration and the reduction in spillage of water from these systems. Swine system specialists have estimated that, prior to 1990, approximately 50% of the water supplied to a hog pen in a day was lost as spillage. Today, more efficient feeding systems have cut these losses significantly. Producers have also opted to replace the nipple drinkers commonly used as a water source in the pen with water bowl–type drinkers.

HORSES

Horses typically consume 2–3 kg of water per kilogram of dry feed. They drink more in hot weather and while doing heavy work. See Table 4.

Table 4. Water Consumption by Horses [5], [6]

Frame size (weight)	Water Requirement Range[a] (L/day)	Average Water Use[b] (L/day)
Small (500 lb)	13–20	16.5
Medium (1,000 lb)	26–39	32.5
Large (1,500 lb)	39–59	49

[a] A result of the animals' environment and management.
[b] Typical consumption over a year on a daily basis under average agricultural conditions in Ontario.

SHEEP

Grazing sheep, particularly in the cooler seasons of the year, can require relatively little additional water beyond what they receive through forage. Hot, drier weather, however, will result in increased water intake. Table 5 provides an estimate of water consumed daily by different categories of sheep.

Table 5. Water Consumption by Sheep[7]

Animal Type	Weight Range (kg)	Water Requirement Range[a] (L/day)	Average Typical Water Use[b] (L/day)
Feeder lamb	27–50	3.6–5.2	4.4
Gestating meat ewe/ram	80	4.0–6.5	5.25
Lactating meat ewe plus unweaned offspring	80+	9.0–10.5	10
Gestating dairy Ewe/ram	90	4.4–7.1	5.75
Lactating dairy ewe	90	9.4–11.4	10.4

[a] A result of the animals' environment and management.
[b] Typical consumption over a year on a daily basis under average agricultural conditions in Ontario.

CHICKENS

The feed requirements of growing poultry are directly related to bird weight. Water requirements are related to feed consumption and to the air temperature. Over half of the water intake of poultry is obtained from the feed. Automatic watering equipment ensures poultry have free access to water at all times.

Once air temperatures exceed 30°C or (87°F), the expected water consumption can increase by 50% above normal consumption rates. Poultry are unable to sweat as a means of regulating body temperature. Their method of heat control involves increasing the respiratory rate (panting) to expel surplus heat, which results in the release of large amounts of moisture from the bird that must be replaced or the bird will become dehydrated. Table 6 shows an estimate of the daily water consumption of 1,000 broiler chickens at different stages of growth. It also illustrates the effect air temperature can have on their water consumption rates. Use Table 6 to design water systems for broilers. Table 7 shows water consumption by season and can be used for estimating average total annual water requirement for broilers.

Table 6. Water Consumption of Broiler Chickens by Age[8]

Chicken Broiler Age (weeks)	Water Requirement (L/1,000 birds/day)	
	21°C	32°C
1–4	50–260	50–415
5–8	345–470	550–770

Table 7. Water Consumption of Broiler Chickens by Season [8]

Season	Average Typical Water Use[a] (L/1,000 birds/day)
Winter, fall, spring	280
Summer	450

[a] Typical consumption over a year on a daily basis under average agricultural conditions in Ontario.

Table 8 presents an estimate of daily water consumption by other common classes of chickens. Again, temperatures have a major influence on the water consumption rate expected from these other poultry classes. Egg production level will also affect the water consumption of laying hens. It has been estimated that laying hens will drink about 4 kg of water per dozen eggs produced.

Table 8. Water Consumption by Chicken Classes Other Than Broilers [9]

Chicken Type	Weight Range (kg)	Water Requirement Range[a] (L/1,000 birds/day)	Average Typical Water Use[b] (L/1,000 birds/day)
Laying hens	1.6–1.9	180–320	250
Pullets	0.05–1.5	30–180	105
Broiler breeders	3.0–3.5	180–320	250

[a] A result of the animals' environment and management.
[b] Typical consumption over a year on a daily basis under average agricultural conditions in Ontario.

Historically, most producers used the bell-style watering system — a circular trough with a gravity-fed reservoir that may be connected to a water line — to provide water to growing birds. Advances in poultry watering equipment in recent years have introduced a nipple-style watering device that contributes to drinker hygiene and reduces water spillage if properly managed. For cage-reared poultry, such as laying hens, there have been recent advancements to reduce water wastage through the use of a cup water device or by installing a trough under the water nipples.

TURKEYS

Drinking water requirements of turkeys are shown in Table 9 and Table 10. Use Table 9 for designing water system capacity and Table 10 for estimating average total annual consumption. Again, water consumption is significantly influenced by the bird's size and the air temperature it is exposed to. The age of turkeys on a farm will depend heavily on market factors. Typically, however, meat turkeys can be classified as follows:

- broiler turkeys (hens) — up to 11 weeks of age
- heavy hens — up to 16 weeks of age
- turkey toms — up to 20 weeks of age

Water consumption of breeding hens kept for egg production is similar to a that of heavy hens at 16 weeks.

Table 9. Water Consumption of Turkey by Age [10]

Turkey Age (weeks)	Water Requirement[a] (L/1,000 birds/day)	
	10°C–21°C	27°C–35°C
1–7	38–327	38–448
8–14	403–737	508–1,063
15–21	747–795	1,077–1,139

[a] Includes spillage losses (typically 2% or less of total consumption).

Table 10. Water Consumption of Turkey by Type

Turkey type	Average Typical Water Use[a] (L/1,000 birds/day)	
	Fall/Winter/Spring	Summer
Broiler turkey	296	402
Heavy hens	431	600
Turkey toms	513	723

[a] Typical consumption over a year on a daily basis under average agricultural conditions in Ontario.

RABBITS, MINK AND ALTERNATE LIVESTOCK

Limited observed and published data are available for less common livestock. The numbers presented in Table 11 are general numbers based on estimates provided by producers and extension specialists who work with these alternate livestock. As with other animals, the key factors affecting water intake are likely to be feed intake, feed composition, environmental temperature, animal size and activity.

The most important factor affecting rabbits' water intake is environmental temperature. They will drink twice as much water during hot summer weather (30°C) as they will during more temperate seasons (10°C). Rabbits on high-fibre or high-protein diets will tend to drink more water than rabbits on low-fibre or low-protein rations. The high-fibre diets require extra water to moisten the feed and to maintain adequate fluid level in the digestive tract. High-protein rations increase the water requirement, because nitrogen from the excess protein is excreted in the urine as urea. The kidney has a limited capacity to concentrate excretory byproducts in the urine, so the more urea excreted by the animal, the more water there is in the urine.

Similar variables affect a mink's water requirements. Mink are traditionally fed a wet diet (65%–75% water), which will provide 80%–85% of the mink's daily water requirements. The remaining water needs must be met by drinking water.

Table 11. Water Consumption – Other Livestock[11], [12]

Animal Type	Weight Range (kg)	Estimated Typical Water Use[a] (L/day)
Rabbit		
• gestating doe	4.5 kg	0.35
• doe (with litter), prior to weaning	8.5 kg[b]	1.02
• 6-wk fryers	1.0 kg	0.30
• 12-wk fryers	2.3 kg	0.64
Mink breeders		
• males	3.0 kg	0.39
• females	1.5 kg	0.29
Growing mink		
• males	2.0 kg	0.26
• females	1.0 kg	0.19

[a] Typical consumption over a year on a daily basis under average agricultural conditions in Ontario.
[b] Total weight: 4.5 kg for doe plus 8 kits @ 0.5 kg

WATER QUALITY

While the focus of this Factsheet is on the quantity of water consumed by livestock, water quality is also important to consider as it can have an impact on the volume of water consumed. Foul odours or tastes, for example, may discourage animals from drinking. Depending on the cause, poor water quality can affect herd health, possibly leading to animal death and economic loss to the producer.

Assess water quality at both the point of use and the source. The contamination of watering devices by dust, spilled feed and fecal matter can lead to the growth of slime. Eventually slime organisms die and decay, creating foul odour and/or tastes.

Typically, poultry is more sensitive to the taste and mineral content of the water than other livestock types. Water treatment systems are increasingly being used in poultry barns. The treatments normally focus on overcoming many problems with iron or minerals in the source water, killing bacteria and eliminating slime/scale from forming in the water lines and on the waterer. If chlorine is added during treatment, the target residual chlorine level in the delivery system is between 3–5 parts per million.

The tolerance to minerals (total salts) in water supplies varies by animal species, with poultry being most sensitive, hogs moderately sensitive and ruminant animals least sensitive. In general, a total soluble salt content of less than 1,000 mg/L is considered a low level of salinity suitable for all types of livestock.[13] Salt contents between 1,000 mg/L and 3,000 mg/L are satisfactory for all types of livestock but may cause watery droppings in poultry or diarrhea in livestock not accustomed to this salt level. Salt levels above 3,000 mg/L are not recommended for poultry and are more likely to result in cases of livestock refusal.[13] Salt levels above 5,000 mg/L are not recommended for lactating animals. Avoid levels above 7,000 mg/L for all livestock.

REFERENCES

[1] Adams, R.S., et al. "Calculating drinking water intake for lactating cows." Dairy reference manual (NRAES-63). Ithaca, NY: Northeast Regional Agricultural Engineering Service, 1995.

[2] McFarland, D.F. "Watering dairy cattle." Dairy feeding systems management, components and nutrients (NRAES-116). Ithaca, NY: Natural Resources, Agriculture and Engineering Services, 1998.

[3] Adapted from The nutritional requirements of beef cattle. 7th revised edition. Washington, D.C.: National Research Council, update 2000.

[4] Froese, C., and Small, D. "Water consumption and waste production during different production stages in hog operations." St. Andrews, Manitoba: Manitoba Livestock Manure Management Initiative. 2001.

[5] Adapted from Nutrient requirements of horses. 5th edition. Washington, D.C.: National Research Council, 1989.

[6] Groenendyk, S., et al. External balance of water and electrolytes in the horse. Equine Vet 1988; J.20:189–93.

[7] Adapted from Nutrient requirements of sheep. 6th edition. Washington, D.C.: National Research Council, 1985.

[8] North, Mack O., Bell, Donald D. Commercial chicken production manual, 4th edition. New York, NY: Van Nostrand Reinhold. 1990.

[9] Adapted from Nutrient requirements of poultry. 9th edition. Washington, D.C.: National Research Council, 1994.

[10] Adapted from Hybrid turkeys: producer guide. Kitchener, ON: Hybrid Turkeys, 2006.

[11] Adapted from Guide lapin. Quebec City, QC: Conseil des productions animales du Quebec Inc., 1998.

[12] Joergensen, G. Mink production.Hilleroed, Denmark: Scientur, 1985.

[13] National Academy of Sciences/National Academy of Engineering. Water quality criteria. Washington, D.C., 1973.

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