

# **Precision Production Water in Intensive Livestock Systems**

## **Aligning Water Quality with Genetics and Precision Feeding**

**Prepared by Solari Water**

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### Executive Summary

**Genetics and nutrition in poultry, pigs, dairy and beef are now highly optimised, but drinking water remains poorly specified and weakly managed (“it’s just water”).**

**Precision Production Water** is defined as water that is physically clean, microbiologically stable, chemically appropriate and oxygen-rich, delivered consistently to support the full expression of genetic potential and precision diets.

Key benefits growers accrue for both birds and animals when **Precision Production Water** is embraced include:

- **Improved** feed conversion and daily gain.
- **Reduced** morbidity and mortality.
- **Better utilisation** of expensive feed inputs.
- **Lower risk** of system breakdowns (disease, heat stress, production drops).

## The Solari Approach

Solari's Precision Production Water system is an end-to-end treatment and control platform that converts raw source water into a tightly specified production input, rather than a background variable. It does this by:

### 1. Characterising the job first, not selling hardware first

- **Start with the biology and production targets:** species, genetic line, life stage, housing (indoor vs outdoor), climate and known health constraints.
- **Assess source water** (bore, dam, river, town supply, recycled) for physical, chemical and microbiological risks.
- **Define a water specification** for that system (turbidity, TDS, key ions, particle size and distribution, microbial targets, DO, pH) aligned with industry guidelines and performance data.

### 2. Using a modular treatment train tuned to that specification

- **Pre-screening** (where required) around 130 µm to catch gross solids from surface sources mostly and protect downstream equipment.
- **Solari OV AFM media filtration** down to 0.45 µm at high efficiency to remove fine suspended solids, protozoa, algae fragments and bacterial flocs that seed biofilms and interfere with drinker performance.
- **Solari Nanobubble aeration** to raise and stabilise dissolved oxygen, improve redox conditions and reduce biofilm formation and off-odours, while supporting a more stable microbial environment in storage and lines.
- **Membrane treatment** (RO/nanofiltration) where TDS, sulphates, chlorides, nitrates or specific contaminants exceed safe or desirable thresholds for the class of stock.
- **Integration** with existing or improved disinfection practices where appropriate.

### 3. Embedding monitoring and feedback

- **Measure key parameters** at source, post-treatment and at the drinker/trough (e.g. turbidity, TDS, key ions, HPC, DO, temperature).

- **Link water quality data** to production KPIs (FCR, ADG, mortality, uniformity, milk yield) to demonstrate value and refine settings.
- Treat the system as a **continuous control loop**, not a one-off installation.

#### 4. Designing for real-world farm conditions

- **Systems engineered** to retrofit into existing sheds and feedlots with minimal disruption.
- **Configurable** for high-flow poultry and piggery lines, dairy parlour and feedlot yard supply, and open beef troughs.
- **Focus on** reliability, maintenance simplicity and compatibility with current health and dosing infrastructure.

**“Solari’s Precision Production Water system turns raw water into a specified production input—physically clean, microbiologically stable, chemically appropriate and oxygen-rich—so that genetics and feed can deliver their full potential in poultry, pigs, dairy and beef.”**

### Introduction: When Water Becomes the Weakest link

Intensive livestock production has changed dramatically over the last few decades. **Modern broiler chickens, layers, pigs, dairy cows and feedlot cattle are genetic specialists**, bred to convert feed into meat, eggs or milk with extraordinary efficiency under tightly controlled housing and feeding conditions. Nutrition programs are formulated to decimal-place precision, veterinary protocols are highly systematised, and environmental controls are increasingly automated. In this context, every part of the production system is expected to perform close to its biological and economic limits.





Despite this, **drinking water is still often treated as a commodity rather than a critical input**. While producers and industry veterinarians invest heavily in genetics, feed formulation and health programs, **water quality is frequently assumed to be “good enough”** if animals are willing to drink it and basic compliance standards are met.

Routine testing tends to be sporadic, **focused on a narrow set of parameters**, and rarely linked systematically to performance outcomes. Lines and drinkers may **harbour biofilms and sediment**; bore and surface waters can carry variable levels of salts, minerals, microbes and organic load that would **never be tolerated** in feed ingredients.

A growing body of research demonstrates that this assumption is no longer tenable. Across poultry, pigs, dairy and beef, studies have shown that **relatively modest differences** in water quality can alter **water intake, feed intake, gut health, growth, feed conversion ratio, mortality and product output**, even when genetics and feed are held constant. In high-output systems with narrow safety margins, water is increasingly the least specified and most variable input. As such, it has become a weak link in the production chain and a significant, and often hidden, source of risk and lost performance.



At the same time, advances in filtration, sensor technology and water treatment now **make it feasible to manage drinking water** with a level of precision comparable to that applied to feed. It is possible to remove fine particles and biofilm precursors, control microbial loads, manage dissolved solids and salts, and optimise dissolved oxygen and redox characteristics in a controlled and repeatable way. **Doing so reframes water from a background variable to a deliberate design parameter in the production system.**



**The purpose of this whitepaper is threefold.**

**First**, to summarise the scientific and practical evidence that drinking water quality materially affects the performance and health of intensively raised poultry, pigs, dairy cows and cattle.

**Second**, to define the concept of Precision Production Water and outline the technical elements required to achieve it at scale.

**Third**, to describe how an integrated approach combining advanced media filtration, oxygenated nanobubble technology and, where necessary, membrane treatment can align water quality with modern genetics and precision feeding *starting from the source water and actively controlling throughout the full production chain.*

**In doing so, we aim to provide producers, nutritionists, veterinarians and integrators with a clear framework and solutions for moving water from an overlooked assumption to a managed asset in their production systems.**

## The Role of Water in Intensive Production Biology

### Water as the primary nutrient

Water is the only nutrient animals cannot compensate for by mobilising body reserves; a shortfall in quality or quantity shows up faster than a shortfall in any single feed ingredient

Proportion of body mass and daily intake represented by water in each species.

#### Body Mass

|                     |                                                                     |
|---------------------|---------------------------------------------------------------------|
| Broilers            | <b>65–75%</b> of live weight is water, even higher in young chicks. |
| Pigs                | <b>55–65%</b> water, depending on age and fatness.                  |
| Dairy & Beef Cattle | <b>55–65%</b> water, with higher proportions in young stock.        |

#### Daily Intake

|                     |                                                                                                                                                       |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| Broilers            | Birds typically drink <b>1.6–2.2 L of water per kg of feed</b> , depending on age, diet and temperature.                                              |
| Pigs                | Pigs often drink <b>2–3 L of water per kg of feed</b> , with nursery pigs at the higher end due to higher metabolic rate and temperature sensitivity. |
| Dairy & Beef Cattle | Dairy cows commonly consume <b>3–5 L of water per kg of dry matter intake</b> , higher in hot weather or early lactation.                             |

### In relation to Cattle Feedlots:

Mature beef cattle are roughly **50–60% water by body weight**; fat-free body tissue is about **75% water, 21% protein and 4% minerals**.

As animals get fatter, the proportion of water in the body falls and lipid rises, but lean tissue stays close to this 75% water figure.

Feedlot and high-production beef cattle typically require in the order of **2–4 L of water per kg of dry matter eaten**, increasing substantially under heat stress, making water the largest single daily input by weight or volume in the system.

## Relationship between water and feed intake

Water intake and feed intake are tightly coupled:

- **If water access or palatability drops**, animals reduce feed intake, even when the diet is otherwise ideal.
- High salt, sulphate or microbial loads can depress water intake or cause diarrhoea; animals may drink erratically, reducing effective nutrient use.

In practice, **anything that affects water intake affects feed conversion**:

- A “**minor**” water aversion can **cancel out** the gains from an optimised diet or genetic line.
- Conversely, improving water quality can unlock feed and genetic potential without changing the ration.

## How water mediates key physiological functions

### Thermoregulation and heat stress

- Evaporative cooling is water-dependent:
  - Birds rely on panting and respiratory evaporation; pigs and cattle increase respiration and peripheral blood flow.
- Under heat stress, water demand rises sharply; if water is hot, dirty or unpalatable, intake may not keep pace.
- High-quality, cool water helps maintain core temperature, protects gut integrity and reduces heat-stress-related performance crashes.

### Digestion, nutrient transport and excretion

**Water is the solvent and transport medium for:**

- Feed particles in the gut.
- Enzymes, bile, and digestive juices.
- Absorbed nutrients in blood and lymph.

### Adequate water supports:

- Proper gut motility and mixing of digesta.
- Stable osmotic conditions in the intestine, reducing diarrhoea risk.

### On the output side, water is essential to:

- Excrete metabolic wastes via urine.
- Maintain manure consistency that's compatible with welfare, hygiene and air quality goals.

## Immune Function and Medication/Vaccine Delivery

- **Immune cells and signalling molecules** circulate in an aqueous phase; dehydration or poor water intake can blunt immune responses.
- In practice, **most intensive systems** rely on water to deliver vaccines, antibiotics and other medications:
- **Water line quality** (biofilms, solids, pH, microbial load) directly affects dose accuracy and stability.
- **Biofilms** can adsorb or inactivate medications and vaccines, leading to under-dosing or uneven dosing within a flock or herd.
- **High-quality water** ensures that when you “treat through the water,” animals receive the intended product at the intended concentration.

Taken together, this is why it is fair to call water the primary nutrient and primary carrier in intensive production. ***It is the largest daily input, drives feed intake, underpins thermoregulation, digestion and waste removal, and acts as the main delivery vehicle for many health interventions.***

**Precision Production Water** is simply the recognition that this central role demands the same level of engineering and monitoring we already apply to genetics and feed.

## What the Evidence Shows: Water Quality vs Performance

Water is not just a carrier; its quality measurably shifts intake, growth, efficiency and health across all major intensive species.

### Poultry – broilers and layers

#### **In modern broilers and layers, water intake tracks feed intake extremely closely.**

Commercial and research data show that broilers typically consume around 1.8–2.0 litres of water per kilogram of feed under normal conditions, and that daily water and feed curves correlate almost linearly over a grow-out. When water intake is suppressed or erratic, feed intake and performance follow.

**Multiple studies demonstrate that differences in drinking water quality alone can alter broiler performance** when genetics and diet are held constant. Trials comparing different water sources (e.g. commercial supply, river and well water) report significant differences in water:feed ratio, feed conversion ratio (FCR) and blood mineral status, even though diets were identical. Flocks supplied with better quality water consistently show improved FCR and growth compared with those on poorer sources.

**Work with treated or ionised drinking water reinforces this pattern.** In one controlled broiler trial, birds receiving treated water with lower total dissolved solids and markedly reduced heterotrophic plate counts and algal loads achieved higher final body weight, greater body-weight gain, improved FCR and significantly lower mortality than birds on untreated tap water, despite similar feed intake. These results confirm that improving physical, microbiological and basic chemical attributes of water can deliver several percentage points of performance gain and survival benefit without altering feed formulation.

**Industry guidance from breeder companies and extension services** reflects this evidence. Water quality specifications for poultry now commonly include limits for total dissolved solids, hardness, iron, manganese, sulphate, microbial counts and pH, and emphasise regular testing and water-system hygiene as essential components of high-performance flock management.

## **Pigs – nursery, grow-finish and sows**

**Pigs, particularly in the nursery phase, are highly sensitive to water quality.** While their tolerances for total dissolved solids are generally higher than poultry, excessive levels of salts (especially sulphates), high iron or manganese and microbial contamination can depress water intake, disrupt gut function and increase diarrhoea and mortality.

**Commercial observations comparing nursery pigs on different water sources highlight the impact.** When pigs consumed poorer-quality well water rather than higher-quality rural supply, producers reported more diarrhoea and dirtier pens, higher mortality and a greater proportion of underweight or “light” pigs at the end of the period. In contrast, groups with better water quality showed cleaner pens, lower health problems and a higher percentage of full-value pigs, even under similar diets and management.

Controlled studies manipulating total dissolved solids and specific ions show that once water salinity or sulphate levels pass defined thresholds, growth performance and health decline. The effects can be subtle at first, presenting as variable intake and intermittent scours rather than dramatic production crashes, but they erode margin through poorer feed efficiency, increased veterinary interventions and more non-performing animals.

**Taken together, these data indicate that for pigs, water quality problems often manifest first as gut-health and uniformity issues and only later as clear FCR differences.**

Removing high-risk components from the water – both suspended and dissolved – is therefore a direct way to reduce background health noise and allow nutrition and genetics to express more consistently.

## **Dairy cows**

**Dairy cows have very high daily water requirements:** several litres of water per kilogram of dry matter consumed and additional demand for milk synthesis and heat dissipation. Any factor that reduces water intake or introduces off-flavours, odours or health risks can quickly impact milk production.

**Surveys of commercial dairy farms consistently link water quality problems with lower milk yield.** In one large dataset, around a quarter of farms had at least one significant water quality issue. These farms produced noticeably less milk per cow per day than farms with good-quality water, and none of the highest-producing herds had unresolved water quality problems. Other work has shown that elevated total dissolved solids and sulphate concentrations can depress water intake and reduce milk yield, especially under heat stress.

### **Beyond intake, poor water quality can affect udder health and general hygiene.**

Algae-laden tanks, biofilm-contaminated lines and high bacterial counts at troughs increase the risk of cows ingesting undesirable organisms or contaminants that challenge the immune system. Clean, cool, palatable water that meets chemical and microbiological guidelines is therefore a prerequisite for achieving and sustaining high milk yields.

### **Beef and feedlot cattle**

Beef cattle are often considered more tolerant of water quality variation than monogastrics, but **they are not immune to its effects**. *Feedlot cattle typically require several litres of water per kilogram of dry matter intake, with demand rising sharply under hot conditions.* When water is highly saline, sulphate-rich or contaminated, cattle may reduce intake or suffer clinical problems.

Research and extension reports link high sulphate and salinity levels in drinking water to reduced weight gain, scours and specific health disorders such as polio encephalomalacia. In some cases, cattle will drink less of unpleasant or poor-quality water, effectively limiting feed intake and slowing growth. Even when intake is maintained, high sulphate or salt burdens can increase the risk of digestive upsets and electrolyte imbalance.

**In extensive cow–calf systems, water quality also influences grazing patterns and utilisation of paddocks.** Cows may avoid water points that are muddy, foul-smelling or heavily contaminated, leading to uneven grazing and underuse of certain areas. In feedlots, where animals have no choice of source, the quality of supplied water becomes a direct management responsibility and a determinant of average daily gain and health.

### **Synthesis across species**

Across poultry, pigs, dairy cows and beef cattle, the same pattern emerges:

- **Water intake** is tightly linked to feed intake, and thus to growth and production.
- **Physical contaminants** (suspended solids, turbidity, biofilm fragments) and microbiological loads (high bacteria, protozoa, algae) directly affect palatability, gut health and the reliability of water-delivered medications and vaccines.
- **Chemical imbalances** (excessive total dissolved solids, sulphates, chlorides, nitrates, iron, manganese; unsuitable pH) can depress intake, aggravate digestive issues and impair performance.

**In modern intensive systems, water quality is therefore a true performance variable, not a mere hygiene consideration.** The evidence base shows that when water is actively engineered and maintained within appropriate physical, chemical and microbiological limits, animals make better use of the genetics and feed already in place.

## **Common Water Quality Challenges in Intensive Livestock Systems**

### **Physical: solids, turbidity and biofilms**

- Suspended solids from surface sources, storage tanks and old lines.
- Biofilm formation in lines and drinkers:
  - Protects pathogens from disinfectants.
  - Sloughing events cause acute microbial challenges.
- Impacts: blocked nipples, uneven flow, harbouring of opportunistic pathogens.

### **Chemical: minerals, salts and pH**

- TDS: what it is and species-specific tolerance ranges.
- Problem ions: sulphates, chlorides, nitrates, high iron and manganese.
- pH outside of recommended ranges reducing disinfectant efficacy and affecting intake.

### **Microbiological: bacteria, protozoa, algae**

- Heterotrophic plate counts, coliforms and pathogens of concern by species.
- Algal growth in tanks and lines; impact on odour, taste and animal acceptance.
- Interaction between microbial load and vaccination/medication through water.

### **Operational: variability and monitoring gaps**

- Seasonal swings in surface and bore water quality.
- Lack of routine testing; reliance on taste or sporadic lab results.
- Inadequate corrective action even when problems identified.

## Defining Precision Production Water



### Concept definition

**Precision Production Water** is drinking water that has been deliberately engineered and monitored to support optimal biological performance and health in intensive livestock systems. It is not defined by a single technology or parameter, but by a set of functional criteria that reflect what high-performance animals actually require from their water every day.

In practical terms, **Precision Production Water** is:

- **Physically clean**

The water has low turbidity and minimal suspended solids down to sub-micron levels. This reduces the supply of material that can seed biofilms in pipelines, clog drinkers or shield microbes from disinfectants. It also improves the consistency of water delivery through nipples, cups and troughs.



- **Microbiologically stable**

Microbial loads are controlled to levels appropriate for the species and production stage, and the system is designed to minimise biofilm formation and sloughing events. This reduces the background challenge from opportunistic bacteria, protozoa and algae, and improves the reliability of water-based medication or vaccination programs.

➤ **Chemically appropriate**

Total dissolved solids and key ions such as sulphates, chlorides, nitrates, iron and manganese are maintained within species-specific ranges. pH is held where it supports both animal acceptance and the efficacy of any sanitising agents. This ensures that water does not limit intake, aggravate gut issues, or compromise mineral balance and performance.



**Iron Removal**

➤ **Oxygen-rich and redox-favourable**

Dissolved oxygen levels and redox characteristics are managed to promote aerobic stability in storage and lines, reduce anaerobic niches within biofilms and sediments, and support more favourable conditions in the immediate drinking environment. This can help limit the growth of unwanted anaerobes and improve overall water freshness and palatability.

**Crucially, Precision Production Water is verified, not assumed. It is characterised at the source and at the point of consumption, monitored over time, and linked to clear action thresholds. It is also designed as part of the production system, taking into account source type, housing, distribution layout, species, life stage and the broader health and nutrition strategy.**

## **Solari Technical Pillars**

To move from concept to practice, Precision Production Water rests on **four technical pillars** that can be combined and scaled according to the demands of the site.

### **1. Precision particle filtration**

**The first step is to remove** fine suspended solids and organic particles that drive turbidity and biofilm formation. Depending on the source, a coarse pre-screen (for example around 130 µm) may be used to intercept larger debris from dams, rivers or open channels. This is followed by advanced media filtration capable of consistently removing particles down to the sub-micron range. This may mean dam aeration is included.

In Solari's approach, a Solari OV AFM Filter, being an electromechanical, hybrid in action filter using Activated Filter Media bed filters water to around 0.45 µm at high efficiency. This level of filtration significantly reduces fine sediments, protozoa, algal fragments and bacterial aggregates that conventional sand filters or coarse screens can pass. The result is clearer water with a much lower load of biofilm precursors entering the distribution system.

## **2. Nanobubble aeration and oxygen management**

Once physical cleanliness is addressed, **the next pillar is the dissolved gas environment.** Nanobubble technology introduces extremely small, stable gas bubbles into the water, greatly increasing the interfacial area for gas transfer compared with conventional aeration. When used with oxygen or air, this can raise and stabilise dissolved oxygen concentrations without the rapid off-gassing associated with larger bubbles. Oxygen is supplied using PSA oxygen concentrators, providing 90% purity.

Higher and more stable dissolved oxygen levels support aerobic stability in tanks and lines, making conditions less favourable for anaerobic microorganisms and some types of biofilm. Nanobubbles also interact with surfaces and microbes through their charge and collapse behaviour, which can help disrupt existing biofilms and reduce the adhesion of new material. Together, these effects contribute to a more stable, fresher water profile at the drinker.

## **3. Membrane treatment for dissolved solids (where required)**

In some settings, source water contains levels of dissolved solids or specific ions that exceed recommended guidelines for the species and class of stock. In these cases, **membrane processes such as reverse osmosis or nano-filtration form the third pillar.** They selectively remove salts, sulphates, nitrates and other dissolved contaminants, allowing the operator to bring water chemistry back into an acceptable range while preserving sufficient mineral content for animal health.

Not every system requires membrane treatment, and not every parameter needs to be pushed towards "ultra-pure" levels. The key is to align final water chemistry with biological tolerance and performance targets, based on measured data rather than assumption.

## **4. Distribution system hygiene and monitoring**

**The final pillar** is the hygiene and monitoring of the distribution network itself. Even the best-treated water can deteriorate if pipelines, tanks and drinkers are poorly designed or maintained. Precision Production Water therefore includes:

- Hydraulic design that minimises dead-legs and stagnant zones.
- Regular cleaning and sanitation protocols compatible with the treated water chemistry.
- Strategic sampling at source, post-treatment and at points of use, measuring physical, chemical and microbiological parameters on a defined schedule.

Together, these four pillars provide a practical framework for delivering Precision Production Water: **water that is engineered to match the demands of high-performance genetics and precision feeding**, rather than being left as an uncontrolled variable in an otherwise finely tuned system.

## Sensitivity Examples – Adjust to Your Numbers

### Assumptions:

- Broiler: 2.5 kg liveweight, baseline FCR 1.60, feed cost \$500/t, 50,000 birds per cycle.
- Layer: 80-week cycle, 450 eggs/hen, 100,000 hens.
- Pig: 120 kg liveweight, baseline FCR 2.7, feed cost 500 \$/t, 10,000 pigs/year.
- Dairy: 40 L milk/cow/day, 300 cows, milk price \$0.50/L.
- Beef feedlot: 300 kg gain, baseline FCR 6.0, feed cost \$450/t, 5,000 head/year.

### 1. Broilers

#### Small FCR improvement

- Baseline feed per bird =  $2.5 \text{ kg} \times 1.60 = 4.00 \text{ kg}$ .
- Improve FCR by 0.03 points ( $1.60 \rightarrow 1.57$ ,  $\approx 1.9\%$  improvement).
- New feed per bird =  $2.5 \times 1.57 = 3.93 \text{ kg} \rightarrow$  saving  $0.07 \text{ kg/bird}$ .
- At \$500/t feed, saving per bird =  $0.07 \times 0.5 = \$0.035$ .
- For 50,000 birds: 1,750 \$ per flock; at 7.5 flocks/year,  $\approx \$13,000/\text{year}$ .

### **Small mortality improvement**

- Baseline mortality 4%, 50,000 placed → 48,000 sold.
- Mortality reduced to 3% (1% absolute, 25% relative).
- Extra birds sold = 500.
- Net margin per bird (after feed) say \$0.50 → \$250 extra per flock, ≈ \$1,900 /year at 7.5 flocks.

### **Avoiding a major water-related health event**

- Example: one water-driven enteric/respiratory event lifting mortality from 4% to 8% in a flock.
- Extra deaths: 2,000 birds.
- Lost margin at \$0.50/bird = \$1,000, plus treatment, labour, performance penalty in survivors.
- Realistic total cost per event can easily exceed \$3,000–5,000 for a 50,000-bird flock.

## **2. Layers**

### **Small FCR (feed per dozen eggs) or persistency improvement**

- Assume 100,000 hens, 450 eggs/hen = 45 million eggs per cycle.
- Improve viable egg output or reduce cracks/seconds by 1% through better health and intake.
- Extra saleable eggs = 450,000.
- At \$0.10/egg margin → \$45,000 per cycle.

### **Avoiding a water-related health event**

- A contamination episode causing a 10% drop in lay for 2 weeks:
  - Daily eggs = 100,000; loss = 10,000 eggs/day.
  - Over 14 days = 140,000 eggs lost.

- At \$0.10/egg margin = \$4,000 for that episode, plus health costs and recovery lag.

### 3. Pigs

#### Small FCR improvement

- 10,000 pigs/year, 120 kg liveweight, FCR 2.7 → feed per pig = 324 kg.
- Improve FCR by 0.05 points (2.70 → 2.65; ≈1.9% improvement).
- New feed per pig = 318 kg → saving 6 kg.
- Feed cost 6 kg × \$0.5/kg = \$3. So, 6 kg = \$3.
- Saving per pig ≈ \$3.
- For 10,000 pigs: \$30,000/year.

#### Small mortality improvement

- Baseline mortality 5% = 500 pigs lost.
- Reduction to 4% → 100 extra pigs marketed.
- Net margin per finished pig (after variable costs) say \$20 → \$2,000/year.

#### Avoiding a major water-related diarrhoea outbreak in nursery

- If a water contamination event lifts nursery mortality by 3 percentage points on 5,000 weaners (e.g. 2% → 5%):
  - Extra deaths: 150.
  - Lost margin per pig (valued at finished) say \$50/pig → \$7,500, plus medication, labour and growth setbacks in survivors.
- A serious episode can easily be a \$5,000–10,000 event once all costs are added.

## 4. Dairy cows

### Small production improvement (via better water intake)

- 300 cows, 40 L/day, milk price \$0.50/L → \$6,000/day gross milk revenue.
- A 2% yield increase through improved intake and heat-stress resilience = 0.8 L/cow/day.
- Extra milk =  $300 \times 0.8 = 240$  L/day.
- Extra revenue =  $240 \times 0.50 = \$120$ /day; over 200 days = \$24,000.

### Avoiding a heat-stress + water-quality episode

- One 7-day heat wave where poor-quality or marginal water knocks yield down 10%:
  - Daily loss = 600 L ( $6,000 \text{ L} \times 10\%$ ).
  - At \$0.50/L → \$300/day; over 7 days = \$2,100 in lost milk alone.
- Add health issues (lameness, mastitis risk) and recovery lag, and a single event can plausibly cost \$5,000+.

## 5. Beef feedlot

### Small FCR improvement

- 5,000 head/year, 300 kg liveweight gain per head, baseline FCR 6.0.
- Baseline feed = 1,800 kg per head.
- Improve FCR by 0.10 point ( $6.0 \rightarrow 5.9$ ; ~1.7% improvement).
- New feed = 1,770 kg → saving 30 kg/head.
- At \$450/t feed (0.45 \$/kg), saving/head = \$13.5.
- For 5,000 head: \$67,500/year.

## Avoiding a water-related health event

- Example: high-sulphate water triggering scours and reduced gain in one 1,000-head pen for a month:
  - ADG drop from 1.6 to 1.4 kg/day = 0.2 kg/day × 30 days = 6 kg lost gain/head.
  - At \$3.50/kg carcass value, 6 kg live ≈ 3 kg carcass = ~\$10.50 lost/head.
  - For 1,000 head → \$10,500 in lost gain alone, plus treatment and extra days on feed.

Even if you halve all these numbers for conservatism, the message is still clear: very small percentage changes in FCR or mortality quickly translate into five- and six-figure annual amounts in high-volume systems, and single water-related health events can cost tens of thousands of dollars.

**Precision Production Water does not need to move performance by 10–20% to be economically compelling. In most intensive systems, a 1–3% improvement in FCR, a 1–2 percentage point reduction in mortality, or avoiding a single major water-related health event is enough to pay for a robust water system many times over.**

## Conclusions

In modern intensive systems, water quality can no longer be treated as an afterthought; it must be managed with the same precision as genetics and feed.

**Precision Production Water provides a coherent, technically grounded framework for doing so, with early evidence indicating meaningful gains in performance, health and risk reduction.**

Solari has created the Precision Production Water system to assist producers, veterinarians, and others involved in the wider production chain to benefit from 'getting water right'. At the start was stated that this is not an equipment first strategy – it is working with the producer to ensure the offered system meets the farm needs, provides the best possible results, at the highest ROI that can be reached.

**Reach out to Solari for further information by phoning +61 7 3118 5927 or email [info@solariwater.com.au](mailto:info@solariwater.com.au)**