

Analysis of water consumption on cattle farms in the Upper Rhine region

BACKGROUND

Against a backdrop of increasing periods of **drought** and **growing pressure** on water resources, understanding water consumption is a **crucial factor** in the **resilience** of agricultural holdings. The Interreg Upper Rhine project '**ResKuh**' aims to strengthen the **adaptability** of livestock farming systems in this region to climate change. In this context, a **diagnostic campaign** was carried out to gain a better understanding of **water use** on farms and to identify areas for **improving their autonomy** and **water efficiency**. To this end, the **MAESTR'EAU** diagnostic tool was used on a selection of French and German farms with different livestock farming systems.

MAESTR'EAU

Maîtrise et Autonomie en Eau par le Stockage, le Traitement et le Recyclage de l'Eau et l'Analyse des Usages

MAESTR'EAU is a diagnostic tool developed by the Chambers of Agriculture of **Alsace** and the **Vosges**, which enables a comprehensive analysis of **quantitative water use** at farm level. It allows **water consumption** to be **quantified** according to the **various uses** on the farm (watering, milking, cleaning equipment, on-farm processing, tourism, crop production, etc.). The tool also identifies the **source** of the water used (public water supply, boreholes, springs, surface water, etc.) and assesses the **farm's dependence** on each of these resources.

Going beyond a simple consumption balance, **MAESTR'EAU** enables the **objective** recording of the **main areas of consumption**, the assessment of the **farm's vulnerability** with regard to water resources, and the identification of **opportunities for improvement**, such as **optimising** facilities, **safeguarding** existing resources, or developing solutions for the **storage** and **recovery** of rainwater.

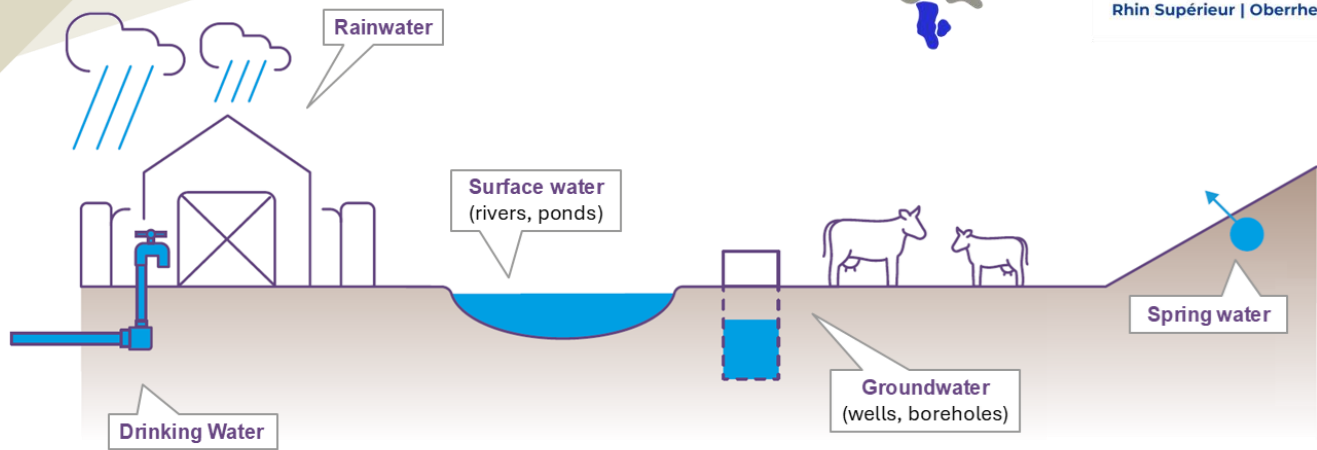
As part of the ResKuh project, the use of this tool enabled the creation of a **harmonised database** on water consumption and water resources for 57 livestock farms in the study area. This provided comparable analytical data across the different **systems** and facilitated the identification of **adaptation options** in the face of the challenges posed by climate change and the resilience of livestock farms.

Legend:

- Dairy – extensive farming (10)
- Dairy – grazing (8)
- Dairy – intensive farming (27)
- Beef – extensive farming (5)
- Beef – grazing (3)
- Beef – intensive farming (4)



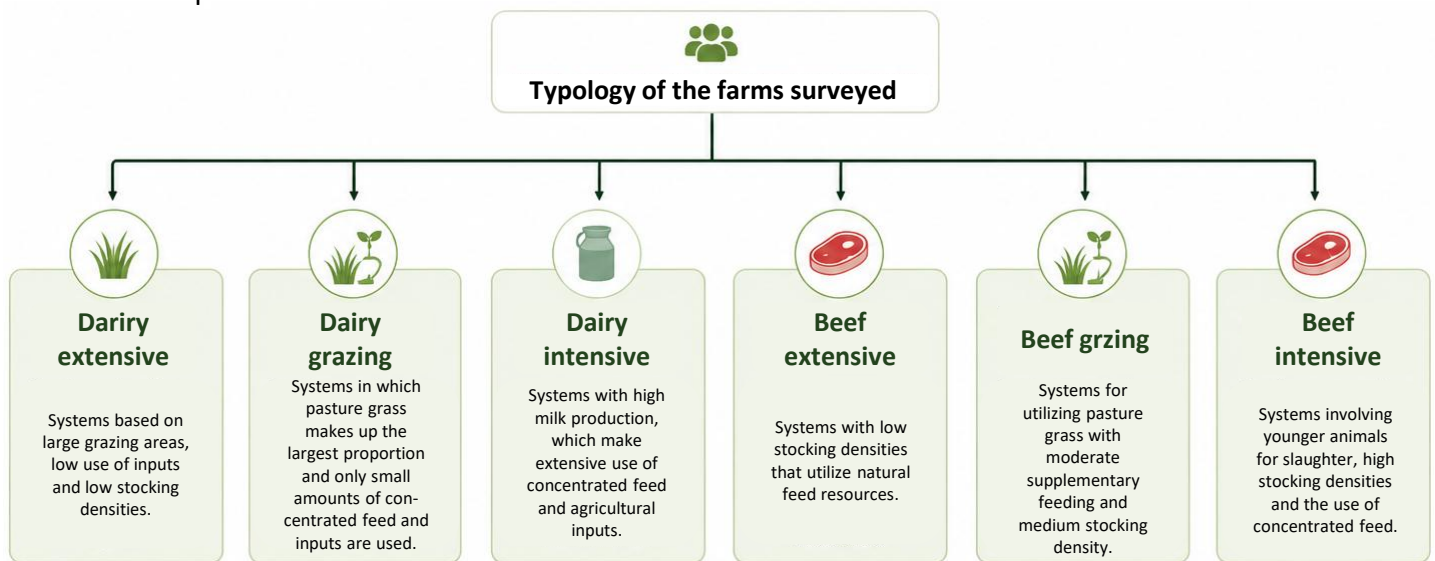
Map of the farms diagnosed in the region.



Source: Water resources on a dairy farm, CNIEL

METHODOLOGY

The analyses were carried out on the basis of site visits and detailed discussions with the operators. To facilitate comparisons.



The farms were grouped according to their **level of intensification** and the **type of use** of their forage areas.

Intensive systems are characterised by a **high proportion of annual crops** in the crop rotation, a **high stocking density** and **limited grazing** by dairy cows.

In contrast, **grazing systems** rely predominantly on **grassland**, with a high priority given to grazing whilst maintaining a relatively high level of production.

Extensive systems, for their part, are characterised by a **strong predominance of grassland areas**, a **lower stocking density** and, in many cases, the **presence of on-farm processing activities** that generate higher added value.

These characteristics have a direct influence on **water requirements**, both in terms of the **volumes consumed** and the **distribution of uses**. This typology therefore appears more relevant than a mere geographical distinction between lowland and mountain areas for analysing the impact of livestock management practices on water consumption and identifying the **factors** that explain the observed differences between farms.

The results presented should be interpreted in the context of the composition of the sample studied and are primarily aimed at identifying **trends** and explanatory factors for the observed water consumption.

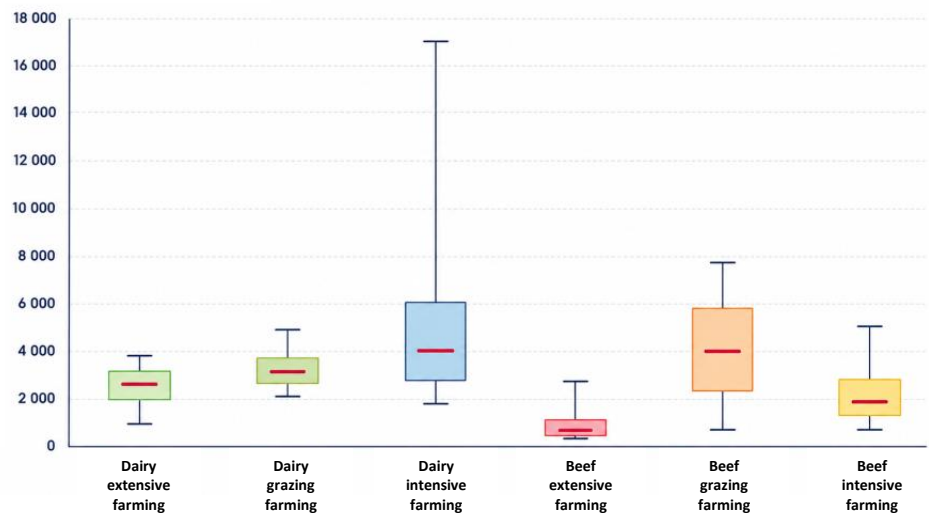
A – KEY FINDINGS

1. Total consumption

Der höchste Verbrauch wird in **intensiven** Milchviehbetrieben verzeichnet. Rinderbetriebe zur **Fleischproduktion** weisen insgesamt einen **geringeren** Verbrauch auf, der hauptsächlich für das **Tränken** der Tiere verwendet wird.

The highest consumption is recorded on **intensive** dairy farms. **Beef cattle** farms generally have **lower consumption**, which is mainly used for watering the animals.

Water consumption (m³)



Watering the animals accounts for the largest proportion of consumption.

2. Breakdown of consumption by purpose

An analysis of the findings shows that **watering** the animals accounts for the **largest proportion of water consumption**, regardless of the specific housing system. However, the extent of this varies depending on how the farms are organised and the nature of the activities carried out there.

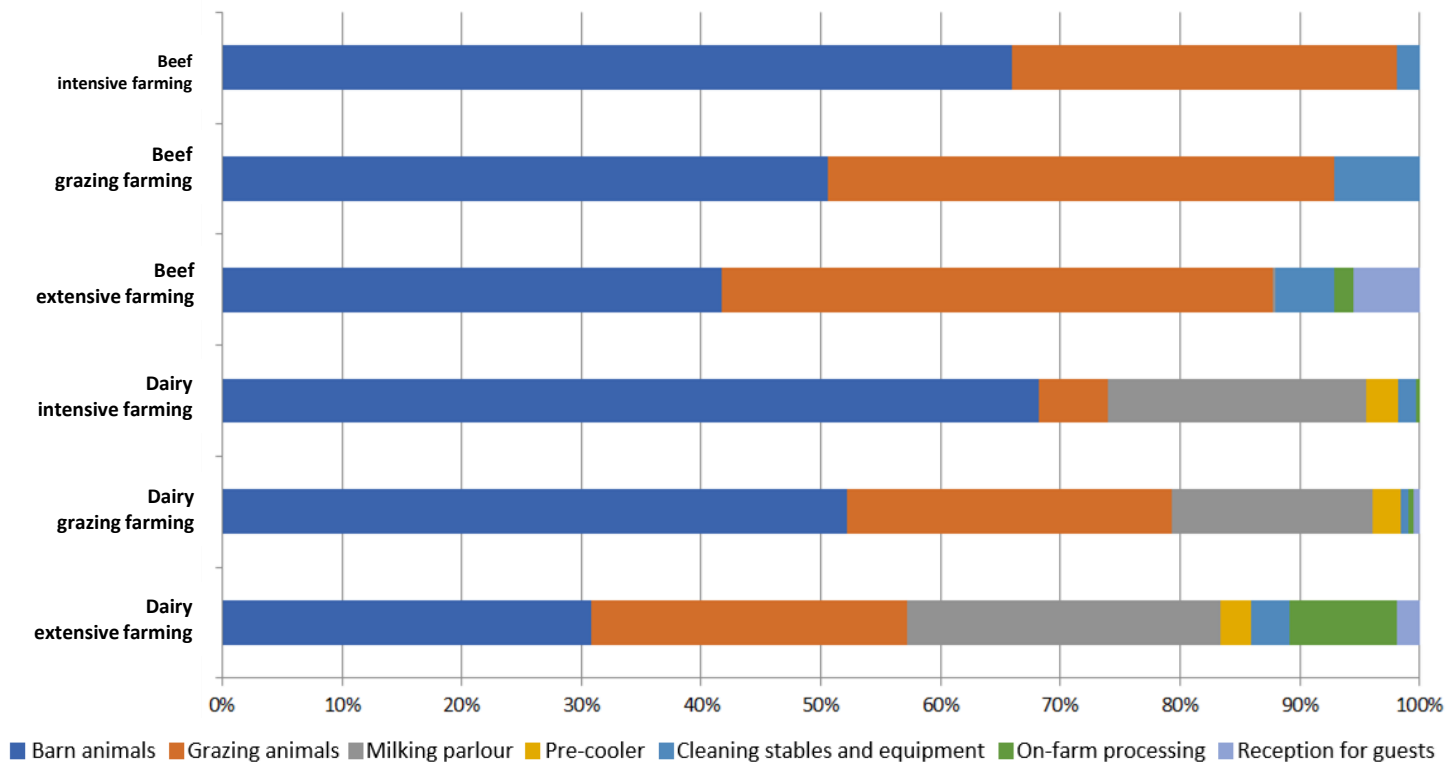
In **intensive dairy farming systems**, water is mainly used to meet the **herd's needs**, with watering accounting for almost **three-quarters** of consumption. The **milking parlour** is the **second-largest** area of consumption, accounting for around 22 per cent, which highlights the importance of technical processes associated with milk production.

Pasture-based dairy farms show a similar profile but are characterised by a higher proportion of **watering on pasture**, which is attributable to greater use of grassland.

Extensive dairy farms exhibit a **more varied distribution** of water uses. Although watering still accounts for the largest share of consumption, its relative proportion is lower, as **supplementary activities** such as **on-farm processing** or **catering for visitors** often take place on the farm. These activities generate specific water requirements for **cleaning facilities**, **processing products** or **catering for visitors**, thereby contributing to a more even distribution of consumption across different uses.

Beef cattle farms exhibit a **considerably simpler** consumption pattern. Over **90 per cent** of the water consumed is used for **watering** the animals, whether in the barn or out to pasture. The remaining uses are of **secondary** importance, which is attributable to generally fewer facilities and the absence of water-intensive processes such as those found on dairy farms.

Overall, these results emphasise that the observed differences between the systems cannot be explained solely by herd size, but also by the **diversity of activities** carried out on the farms and by decisions regarding **farm management**. **Watering** remains the most important lever for controlling water consumption, whilst the uses associated with milking and processing on dairy farms require particular attention.

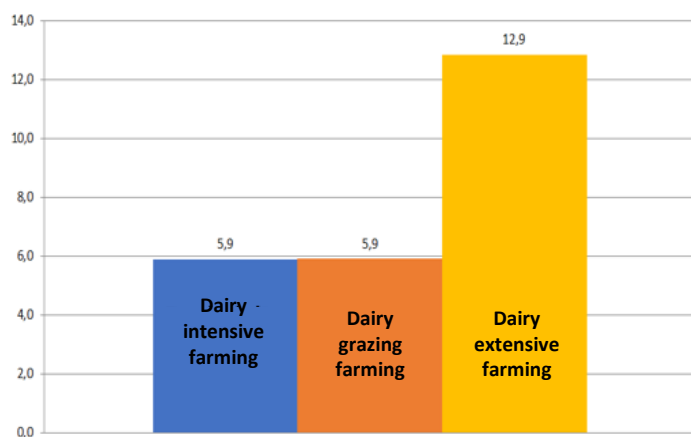


3. Water consumption in relation to milk production

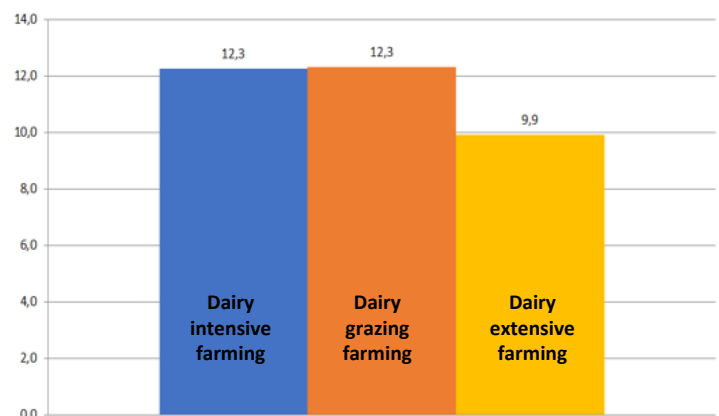
An analysis of water efficiency shows that intensive dairy farming systems and pasture-based systems have very similar figures, with water consumption of around **5.9 litres per litre of milk produced**. In contrast, extensive dairy farming systems show higher consumption, amounting to up to **12.9 litres of water per litre** of milk, or 11.5 litres if water consumption for on-farm processing and animal husbandry is excluded from the calculation. This difference can be explained mainly by generally lower milk production per farm, but also by the frequent presence of diversification measures that require additional water.

However, the analysis must be viewed in a more nuanced way when considered in relation to the economic value generated. In fact, extensive systems demonstrate better economic water efficiency thanks to on-farm processing and the marketing of high value-added products. They thus consume, on average, **9.9 litres of water per euro** of milk turnover, compared with **12.3 litres per euro** for pasture-based and intensive systems.

These results show that, whilst extensive systems may appear less productive when assessed solely in terms of the litres of milk produced, they **make better use** of every cubic metre of water used when the wealth generated by the activity is taken into account.



Water consumption (litres) per litre of milk produced



Water consumption (litres) per euro of turnover

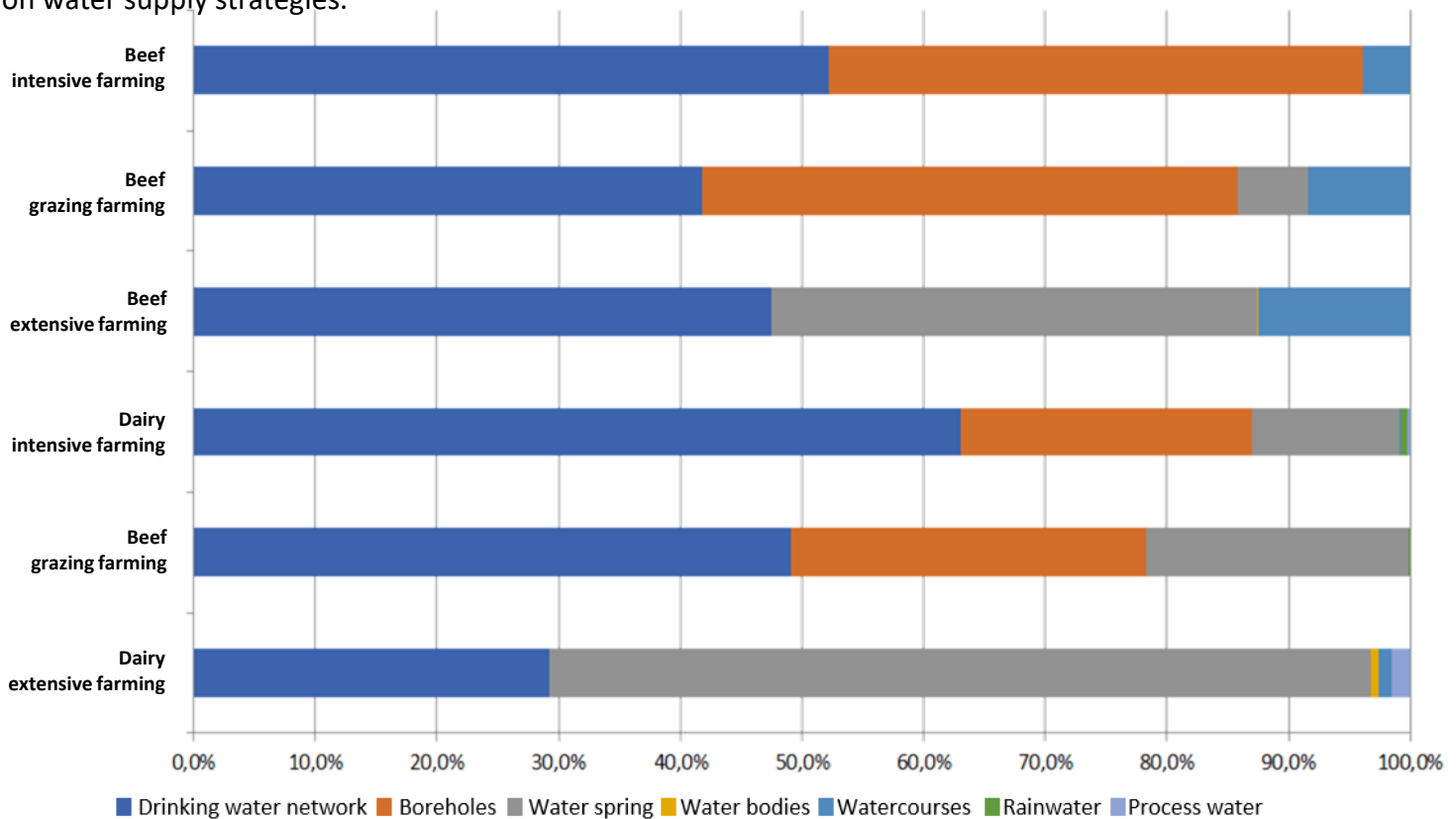
4. Mobilised water resources

The resources utilised vary considerably depending on the systems under investigation.

Intensive dairy farms rely mainly on the **mains water supply** and **boreholes**, which account for **63 per cent** and **24 per cent** of consumption respectively. This situation can be partly explained by the location of many **intensive farms** in the Alsatian Plain, which are situated within or near the **Rhine groundwater body**, where access to **groundwater** is relatively **easy** and the water supply infrastructure is well developed. The differences observed are therefore attributable both to the specific characteristics of the livestock farming systems and to the particular hydrological conditions of the areas studied, which were investigated and analysed as part of the cross-border project. In contrast, the **extensive** systems, which are predominantly located in the **Vosges valleys** and **mountainous areas**, make greater use of **local natural resources**, in particular **springs**, which account for almost **68 per cent** of the volume consumed.

The **grazing systems** occupy an **intermediate position** and are characterised by a **more diversified supply**, combining piped water networks, boreholes and springs.

This distribution illustrates the combined influence of the livestock farming system and spatial conditions on water supply strategies.



Type of resources used by farm type

APPROACHES IDENTIFIED AS PART OF THE DIAGNOSIS

The analyses carried out as part of the ResKuh project have identified **several areas** of focus through which farms can **reduce** their **water consumption** whilst simultaneously **strengthening** their **independence** from this resource. These areas of focus relate to **monitoring** consumption, **optimising** usage and **diversifying** the resources utilised.

A first area for improvement is based on a **better understanding of the volumes consumed**. By installing **meters** on key resources or at specific strategic locations, **operational faults** can be quickly detected, **excessive consumption** identified and the **effectiveness** of the measures taken assessed. This knowledge is often an **essential prerequisite** for any water-saving measure.

Watering the animals, which accounts for the **largest share of consumption** in almost all the systems studied, also offers **considerable potential for improvement**. In particular, the assessments have shown how important it is to carry out **regular checks on the pipework networks** in order to detect **leaks**, verify that the systems are functioning correctly, and adjust **flow rates** to the animals' actual needs. Securing and optimising watering points in the pasture are also key measures, particularly on extensively managed farms.

On dairy farms, the **milking parlour** is the **second-largest consumer** of water. Savings can be achieved by optimising cleaning cycles, using more water-efficient systems, and recovering and reusing water from the pre-coolers. Utilising the recovered heat can also help to improve the overall efficiency of the systems (see the findings of the Energy Management Group).

Farms that offer **on-farm processing** or **visitor activities** present specific **opportunities for improvement**. Better management of **cleaning procedures**, the use of **suitable equipment**, reducing the amount of water used for cleaning, or even the **recovery of water** for specific technical purposes make it possible to reduce water consumption **without compromising hygiene standards**.

Visitor facilities can also benefit from water-saving installations, such as **timer-controlled taps**, **dual-flush cisterns** or measures to raise visitors' awareness.

Finally, **increasing water self-sufficiency** is a key lever for **adapting to climate change**. **Rainwater harvesting** is proving to be a particularly attractive solution for uses that **do not require drinking water**. However, the implementation of this solution must be based on a design that is adapted to the available roof areas, storage capacities and seasonal fluctuations in demand. More broadly, **diversifying resources**, securing existing water abstraction points and improving the supply to pastureland help to **reduce farms' dependence** on the most vulnerable resources.

The analyses thus show that the potential savings are based on a **combination of complementary measures** that bring together **water savings**, **improved consumption monitoring** and the **strengthening of farms' self-sufficiency**. This holistic approach proves to be a key lever for increasing the **resilience** of livestock farming systems in the face of current developments.



Watering in the pasture must not be neglected either!

GENERAL CONCLUSION

The analyses carried out as part of the ResKuh project provided a **comprehensive** and objective overview of water consumption on farms that are representative of the **diversity of livestock farming systems** in the region. The use of the MAESTR'EAU tool has highlighted the benefits of an integrated approach, which makes it possible to analyse **consumption**, the **resources used** and **potential areas for improvement** at farm level simultaneously.

Beyond the differences observed between the systems, the study emphasises that water management represents a **strategic challenge** for all livestock farms. A precise understanding of water use, securing resources and developing water self-sufficiency are proving to be **key levers** for strengthening farms' resilience to climate change and the **increasing pressures** on water resources.

The findings thus provide a valuable reference framework for **supporting farmers**, tailoring advisory services and offering institutional stakeholders food for **thought on sustainable water** management in livestock farming regions.