ENVIRONMENT

RUMINANT LIVESTOCK FARMING AND WATER RESOURCES

UNDERSTANDING & EXPLAINING THE SERVICES PROVIDED BY LIVESTOCK FARMING

«In what way is ruminant livestock a key player in water resources?»

1

Grasslands, areas that only ruminants can enhance, are a real asset for water conservation, flood absorption and maintenance, or even improvement of water quality.

2

The water consumed on farms is mostly used for animal feed.

Farmers are implementing good practices to reduce water consumption.

3

The efforts made by farmers and public stakeholders have led to a better water quality in farming areas.

Effluent management is a major area of progress, and the sector is already implementing innovations on emission sources.

INSTITUT DE L'ELEVAGE idele

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RUMINANT LIVESTOCK FARMING AND WATER RESOURCES

WHAT ARE WE TALKING ABOUT?

On Earth, water is a renewable resource thanks to rainfall, but it is not unlimited. The volume of fresh water represents 3% of the total water volume. At the global level, the annual amount of freshwater available per person has decreased by about 20% over the past 20 years (FAO, 2020). The deficit in water resource availability is a source of local conflicts of use.

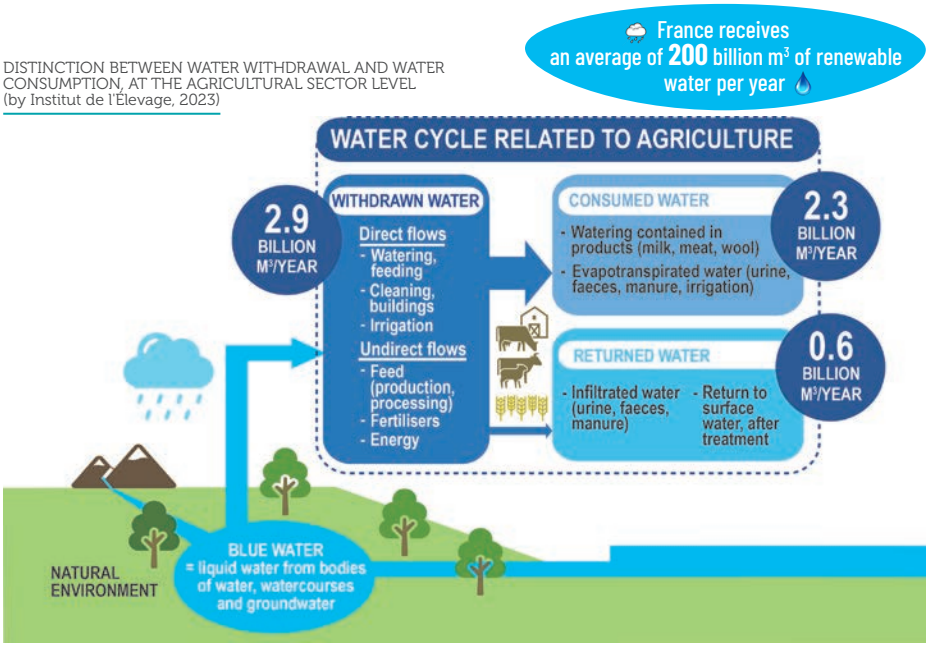
Although the overall trend is decreasing, in France, between 2010 and 2019, an average of 32.8 billion m^3 of fresh water was extracted annually, 9% of which by the agricultural sector. This represents 2.9 billion m^3 extracted, some of which ends up in plant and animal products intended for human consumption: 2.3 billion m^3 are consumed by agricultural sectors, while the remaining 0.6 billion m^3 return to the environment from which they were taken.

Consumption corresponds to the portion of the extraction that does not directly return to the natural environment. It includes the water contained in agricultural products. The water extracted includes network water and water contained in feedstocks, including imported ones.

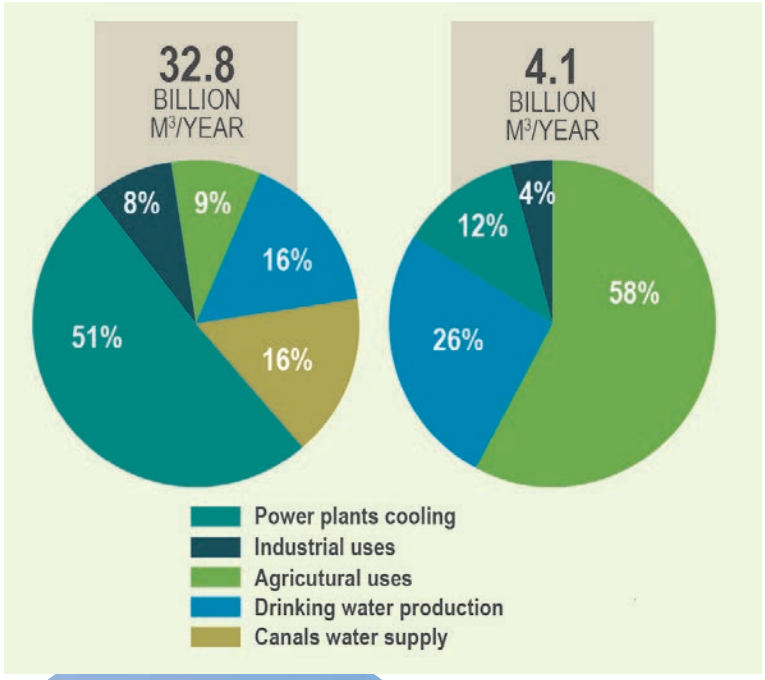
In general, the quality of surface water and ground water is improving in France, but it is necessary to ensure the sustainability of their uses through prevention, protection, and restoration actions (Ministry of Ecological Transition and Territorial Cohesion, 2022).

Ruminant livestock is a key player in this resource: it consumes it, returns it, and influences its quality.

DISTINCTION BETWEEN WATER WITHDRAWAL AND WATER CONSUMPTION, AT THE AGRICULTURAL SECTOR LEVEL
(by Institut de l'Élevage, 2023)



DISTRIBUTION OF GROSS BLUE WATER* WITHDRAWAL IN FRANCE (LEFT) AND DISTRIBUTION OF FRESH WATER USE IN FRANCE (RIGHT)
(National Bank of des Quantitative water sampling– Data processing by hydrographic sub-basins, 2023)



Blue water: liquid water from water bodies, rivers and groundwater

1 Grasslands, an asset for water conservation and water quality

The maintenance of permanent grasslands prevents losses and nitrogen leaching
Thanks to the absence of bare soils and the efficiency of plant use of nitrogen emitted by excrement, permanent grasslands result in less leaching and therefore fewer nitrogen losses (Idele, 2019). Indeed, maintaining grass in forage systems ensures soil stability, nitrogen immobilization, and its return to plants. Thus, in addition to providing numerous ecological services (carbon storage, biodiversity preservation, etc.), promoting livestock on permanent grasslands preserves water quality. It is also important to note that grasslands receive almost no phytosanitary treatments. Generally speaking, the predominance of grasslands and wooded areas in livestock farming zones retains certain pollutants, preventing them from reaching the waters.

Permanent and humid grasslands facilitate water conservation
Without livestock farming, humid grasslands would almost no longer exist. If livestock farming consumes water like any other production activity, it also provides regulatory ecosystem services, notably through the maintenance of grasslands in areas hostile to other agricultural activities. For example, in certain areas like the humid grasslands of the Limousin Regional Natural Park, the decline in livestock farming has led to the proliferation of willows, which has caused the drying up of rivers and surface waters. This phenomenon has also led to the implementation of subsidies to reintroduce livestock farming on wet pastures.
Similarly, if wetlands are located near watercourses (which is often the case), they are also privileged areas for preventing floods by limiting rapid drainage toward watercourses. They thus constitute buffer zones for water volume management (floods, etc.).

KEY FIGURES

In non vulnerable areas, the benefits of livestock farming on water quality are induced by forage resources, which account for more than **70%** of the agricultural land use in the area. **3/4** of these areas are permanent grasslands (Idele, 2019).

In France, **95%** of grasslands receive no herbicide treatment (Idele, 2022b).

LEARN MORE...

...about the environmental services provided by grasslands,

CHECK OUT THE SHEETS ➡
« Ruminant livestock farming and biodiversity »,
« Ruminant livestock farming and greenhouse gases »,
« Ruminant livestock farming and soil quality ».

RUMINANT LIVESTOCK FARMING AND WATER RESOURCES

2 Water consumption in ruminant livestock

In livestock farming, it is mainly the animals that consume the water

Water is essential for crop growth, animal feeding, and watering.

In ruminant livestock, feed is the primary water consumption item, regardless of the sector. This water corresponds to the water contained in the forages and concentrates ingested by the animals, while drinking water represents the 2nd largest consumption item.

The average daily water consumption per watering of a lactating dairy cow (23 L of milk/per day) ranges from 55 to 120 L (ASSECC, 2022). In case of thermal stress (from 24°C and 30% humidity), a cow consumes 20% more water (CNIEL, 2021). The level of collection and the proportion of manures (urine, dungs) vary greatly depending on the types of feed (more or less moist), the characteristics of the animals (breed, weight, etc.), and the climatic conditions.

The other water consumption items in livestock farming are infrastructure and machinery (production of materials, maintenance and cleaning of buildings and equipment) and energy production.

Farmers are implementing solutions to save and recycle water

Avoiding leaks and water waste is the first lever that can be activated. Then, water savings can be achieved through:

- minimizing the amount of manual washing;
- a good cleaning of the facilities;
- recycling whitewaters (water from cleaning milking and cheesemaking equipment);
- cleaning the floor with rainwater of even using rainwater for animal watering if its quality is controlled;
- implementing crops that require less or no irrigation;
- prioritizing the grazing;
- using more water-efficient irrigation systems;
- and so on.

The irrigation of crops is sometime necessary to secure the forage resource against climatic hazards

The irrigation of forage areas is rare in ruminant livestock (Idele, 2022a). It varies depending on climatic conditions and ease of access to water.

Occasional and rational irrigation secure harvests and improves the forage autonomy of farms (Rieutort *et al.*, 2014). Faced with the increasing frequency and intensity of heat waves and droughts, farmers are adapting their practices and farming systems (choice of species and varieties, cultivation practices, rotations, etc.) by reducing water consumption whenever possible (Dumont *et al.*, 2016).

KEY FIGURES

Water consumption by cattle farms: less than **1%** of national extractions (Idele, 2023).

When it's hot (from 24°c and 30% humidity), a cow drinks **20%** more water (CNIEL, 2021)

Water consumed in dairy farmings (cattle, sheep, goats): **from 6,4 to 33 L** of water per L of milk.

Water consumed in suckler farms (cattle and sheep): **from 32 to 183 L** of water per Kg of meat.

Economical cleaning practices in a milking parlour can save up to **37%** of water consumption (Idele, 2010).

In livestock farming, only **1%** of the forage area is irrigated (Idele, 2022a).

3 The role of ruminant livestock in conserving water quality

Tendancy: preserving and improving water quality
In ruminant livestock, the use of mineral nitrogen is reduced thanks to animal effluents. This addition of organic matter to the soils improves biological activity and reduces nutrient losses to the water. In vulnerable areas, trends toward improved water quality are mainly observed in livestock areas. Outside vulnerable zones, the very structure of these areas relies on a predominant proportion of grassland and forest environments with low fertilization. These, associated with herbivorous livestock farming, ensure very good water quality in these territories (Idele, 2019).

Toward more efficient ruminant livestock systems
Efficiency and the apparent nitrogen balance are commonly used indicators to evaluate production systems and their environmental consequences. Efficiency reflects the technical effectiveness of using an input and is a determinant of economic profitability. Significant improvements in the efficiency of nitrogen use at the animal level have been achieved through adjustments to herd feeding and genetic improvement. Further progress is still possible, notably through precision feeding techniques. Nevertheless, the gains will be moderate because today, rations are already at floor levels in protein (Peyraud *et al.*, 2012) thanks to the work of farmers to distribute rations as close as possible to the animals' needs and avoid losses and waste.

The apparent nitrogen balance varies depending on the systems
The apparent nitrogen balance, or nitrogen balance, allows for the evaluation of the main mineral flows at the farm level. It is determined by calculating the difference between the nitrogen inputs on the farm (feed, forage, fertilizer, etc.) and the outputs (milk, meat, crops). The surplus is potentially lost from the system to the water, air, or soil (Idele, 2019).
In France, nitrogen balances vary by region because there is a diversity of ruminant livestock in terms of operational structures, farming practices, and environmental responses. Through the development of virtuous practices, the improvement of nitrogen use efficiency, which is accompanied by a reduction in the nitrogen balance, helps to limit losses to the environment and to get as close as possible to the economic optimum to improve farmers' incomes.

KEY FIGURES

Consideration of livestock effluents as farm fertilizer has reduced the consumption of synthetic nitrogen by more than **20%** in vulnerable areas (Idele, 2019).

In western dairy farms, the nitrogen balance surplus has been reduced by **35%** in 15 years, due to better fertilization management, notably a **50%** reduction in the use of mineral fertilizers (Idele, 2019).

ITEMS OF THE APPARENT NITROGEN BALANCE AT THE SCALE OF THE AVERAGE FRENCH FARM 2013-2021 IN KG N/HA OF UAA (DATA FROM CAP'2ER®)

ITEMS IN THE APPARENT NITROGEN BALANCE (IN KG N/HA)	
Inputs	
• Forages	6
• Concentrates	51
• Mineral fertilizers	68
• Imported manure	16
• Symbiotic fixation	22
• Atmospheric deposit	10
TOTAL INPUTS	173 Kg N/ha
Outputs	
• Milk	26
• Meat	6
• Crops	31
• Exported manure	3
TOTAL OUTPUTS	65 Kg N/ha

APPARENT BALANCE SURPLUS

Inputs - Outputs = 108 kg N/ha

POTENTIAL BECOMING OF APPARENT BALANCE SURPLUS

- Losses to the atmosphere: 45 kg N/ha
- Losses to water: 42 kg N/ha
- Storage in soil: 21 kg N/ha

Source: Data CAP'2ER®, means 2013-2021

RUMINANT LIVESTOCK FARMING AND WATER RESSOURCES

3 The role of ruminant livestock in conserving water quality

The management of livestock effluents: positive developments thanks to the commitments of the agricultural profession

Two Agricultural Pollution Control Programs (PMPOA) have enabled the implementation of works in 90,000 farms, helping to limit the loss of organic nitrogen into the environment through storage facilities better suited to agronomic needs. They now allow for the right type of manure to be applied, on the right crop, at the right dose, and at the right time.

The farmers are also working to rationalize their nitrogen fertilization. Whatever the situation of the farm, a fertilizer plan must be put in place in order to (i) adjust nitrogen inputs to the needs of the plants, (ii) properly value farm fertilizers as a priority, and (iii) limit fertilizer purchases. Thus, thanks to a better utilization of effluents, deliveries of nitrogen fertilizers have dropped by 30% over nearly 25 years in livestock areas. This significant decrease in nitrogen fertilizer consumption also contributes to the improvement of water quality.

In general, herbivore farming systems optimized in terms of nitrogen management show a low dependence on nitrogen inputs and maximize the use of forages produced on the farm, thereby allowing for nitrogen recycling within the production system. There is still room for improvement, although less thanks to the advancements of the past 20 years, and efforts are maintained to reduce nitrogen losses in the environment (Idele, 2019).

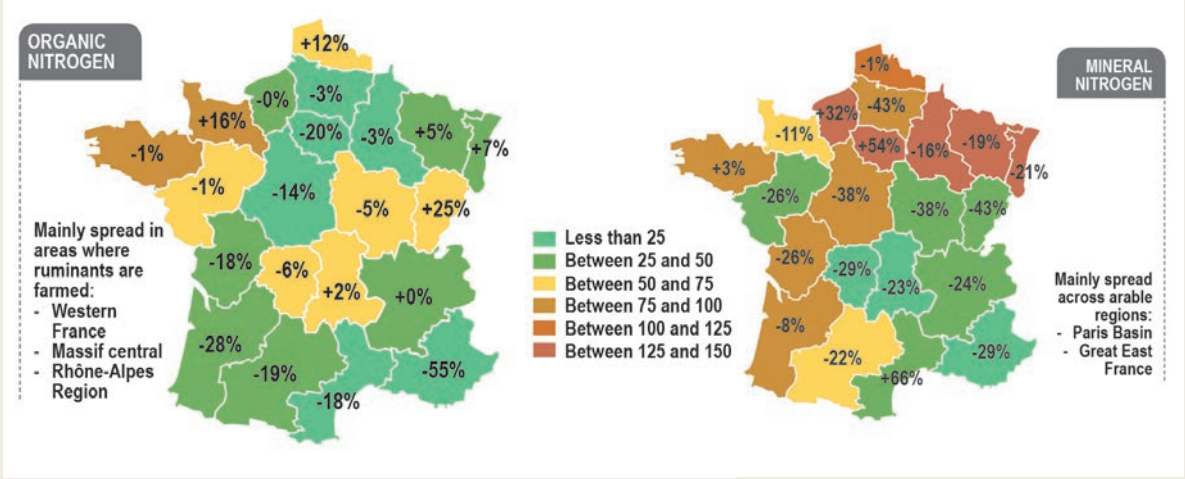
KEY FIGURES

95% of the total organic nitrogen produced in France is generated by farms with herbivore livestock (Idele, 2019).

-25% of mineral nitrogen consumed in metropolitan France since 2000 in herbivore farms (UNIFA, processing Institut de l'Élevage).

77,600 herbivore farms have joined PMPOA 1 and 2 (Idele, 2019).

NITROGEN PRESSURE IN 2020 (IN KG N/HA OF UAA) (BDNI, AGRESTE AGRICULTURAL CENSUS PROCESSING INSTITUT DE L'ÉLEVAGE) AND EVOLUTION COMPARED TO 2010 (IN %) (UNIFA – PROCESSING INSTITUT DE L'ÉLEVAGE).



ACTIONS AND TOOLS IMPLEMENTED BY THE SECTORS

CAP'2ER® Tool

Its goal is to assess the environmental impacts and positive contributions at the scale of a ruminant livestock. Among the environmental indicators evaluated by the tool, climate change is taken into account through CH_4, CO_2 et N_2O emissions within the farm's perimeter, workshops, products, and emission sources. The tool is multi-sectoral, it now applies to dairy cattle, beef cattle, goats, sheep, and field crops.

As of 31/08/2023, 1,882 advisors have been trained and 36,740 CAP'2ER® diagnostics have been conducted since 2015 in connection with the Carbon Dairy, Low Carbon Dairy Farm, Beef Carbon, Green Sheep, and Sustainable Goat Farming initiatives. The deployment of the tool is national but also European.

The guide to good environmental practices in livestock farming

Aimed at all livestock stakeholders (pigs, herbivores, poultry): farmers, technicians, etc., this guide in the form of fact sheets allows livestock sectors to reduce their environmental impacts by advising on techniques, practices, and equipment that will notably help reduce the environmental impact of livestock farming on water (but also air or soil).
(https://www.rmtelevagesenvironnement.org/nouveau_gbpee_2019).

Dexel and Pré-Dexel Tools

The Pré-DeXeL tool is mainly used by farmers located in vulnerable areas, but it can also be used by technicians from Chambers of agriculture and advisory organizations. The tool allows for an assessment at a given moment of the standard storage capacities for farm effluents. The DeXeL tool is historically the software that has accompanied the compliance of farms since the 95s. Intended for advisors from Chambers of agriculture and consulting organizations, it helps to refine the farmer's thinking by precisely calculating the sizing of their storage facilities that apply to their livestock and practices. It also allows for testing solutions to address a situation of undersizing. Moreover, the tool can calculate agronomic capacities and size treatment systems for lightly loaded effluents.

SERVEAU project: Grazing of cover crops by sheep to improve water resource quality

This project aims to objectify the interest that the valorization of intercrop covers by sheep can represent in order to protect the quality of potable water resources through better nitrogen recycling and a reduction in pesticide use.

(https://idele.fr/interagit/publications/detail?tx_atolidelecontenus_publicationdetail%5Baction%5D=showArticle&tx_atolidelecontenus_publicationdetail%5Bcontroller%5D=Detail&tx_atolidelecontenus_publicationdetail%5Bpublication%5D=17135&cHash=739e02dd6545ec3aa607af8933b1b736).

Agribalyse Program

This program provides reference data on the environmental impacts of agricultural and food products through a database based on the Life Cycle Assessment (LCA) methodology. Among the LCA indicators provided in Agribalyse, there are notably water resource depletion, acidification, eutrophication and freshwater ecotoxicity (https://doc.agribalyse.fr/documentation).

The SIP REVALIM

Created by ADEME, INRAE, Acta and ACTIA, the GIS REVALIM, a scientific interest group (SIP) aims for better consideration of environmental issues by stakeholders in the agricultural and agri-food sectors in their activities, by assisting them and contributing to the eco-design of their activities. The SIP also provides evaluated and reliable data to inform consumers and citizens while also providing information on the uses and limitations of this data. The SIP also supports public authorities in their actions for the ecological transition of the agricultural and agri-food sectors. Finally, the SIP develops tools for research and education (ADEME, 2021).

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