UAB Universitat Autònoma de Barcelona

Water Footprint in Dairy Cattle: A Response to Climate Change and Global Food Demand

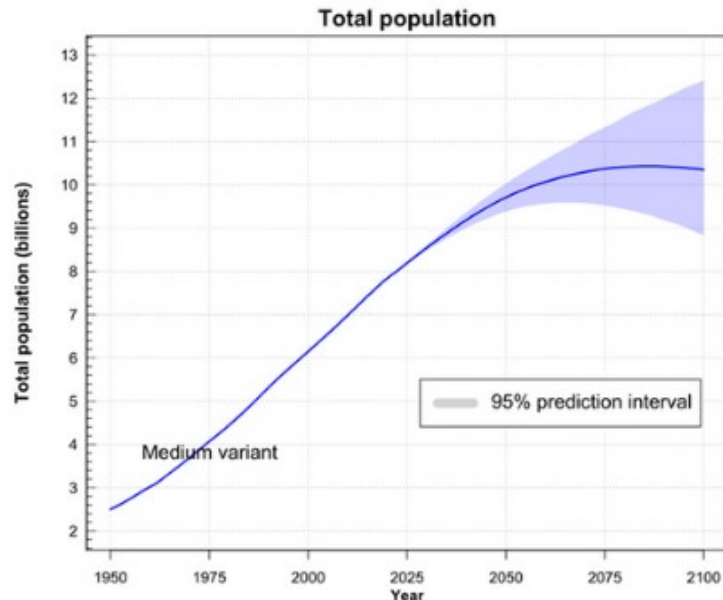Inés Sellarès Rodríguez   June 2024   Final degree project

Introduction

Climate change and dwindling water resources pose significant challenges to livestock farming, which consumes large amounts of water for animals, feed, cooling, and cleaning. The global population and the demand for dairy products is rising.

Figure 1. Global population and future tendency (UN, 2024).

Aim of the review

Analyze the Water Footprint (WF) of dairy cattle farms in different geographical areas and look for common points to know what the WF depends on, in order to have an idea on how to reduce it.

Criteria and methodology of the review

Keywords used in combination with each other: "water footprint", "production animal", "milk", "cow", "livestock", "cattle", "bovine", "water use", "dairy".

PubMed   Scopus   Web of Science

Best match criteria → Articles with relevant titles (40%) → Relevant abstract (80%) → Meet the research objectives (95%) → 10 articles

Results and discussion

The WF of dairy cattle ranges from 0.017 to 2.7 m³/kg of FPCM, with an average of 1.23 m³/kg of FPCM and a standard deviation of 0.894%. Primary contributors to WF variations are:
- Feed production: 99% of the WF
- Water used for cow watering and servicing: ranging from 0.4% to 9%

Factors such as milk yield, feed components, regional water availability, and management practices influence water productivity.

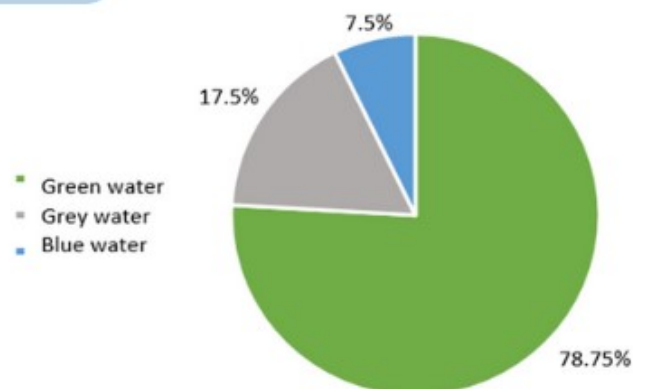↑ Regional rainfall patterns ↑ WF values

Green water
Found in soil and crucial for plant growth, influenced by environmental factors. The variation is influenced by agricultural systems, management practices, and environmental conditions.

Water recycled from domestic and industrial activities. The variability depends on agricultural practices, industrialization levels, and wastewater management.
Grey water

Blue water
Surface and ground water that are essential for drinking, irrigation, and industrial use. Varies depending on production systems, water management practices, and local climate.

Figure 2. Main water dimensions and their contribution to the Water Footprint.

Recommendations to reduce the WF:
- Use feed with lower water requirements, import feeds from regions with lower water consumption and efficient on-farm water management
- Select low water-consuming cow breeds
- Optimize chemical use and wastewater treatment technologies
- Tailored strategies for individual farms can improve water efficiency and sustainability.

Conclusions

This is a recent topic with a limited number of articles available, reflecting its emerging nature. The results demonstrate significant variability, indicating that green water constitutes the majority component, followed by grey and finally blue water. Furthermore, effectively reducing the WF requires a multifactorial approach that addresses various factors and dimensions of water use.

References: UN. (2024). World Population Prospects 2022.