A scoping review on rotational grazing in beef cattle systems to mitigate climate change and support plant diversity

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Abstract

Background: The global population is projected to increase exponentially during the next decades, intensifying the food supply chain and, thus, potentially leading to increased extreme weather events. Given that cow-calf operations are an important contributor to Canada's GDP, there is a need to consolidate the evidence on sustainable grazing practices to mitigate climate change. Recently, the government of Canada has encouraged the use of rotational grazing (RG) within their Sustainable Agriculture Strategy to improve soil health and decrease greenhouse gas (GHG) emissions. However, the effectiveness of RG in improving soil health and preventing climate change remains unclear.

Objective: Summarize the evidence on the impact of RG on soil health, GHG emissions, plant diversity, and productivity in cow-calf operations in Canada and similar climate regions.

Materials and Methods: This scoping review followed the PRISMA-P reporting guidelines. Before conducting the review, a protocol was developed and published online. The population of interest was beef cow-calf pairs and pregnant heifers. The intervention was RG; the outcomes were GHG emissions, soil health, plant diversity, and productivity parameters. Included studies required a concurrent comparison group and could be randomized controlled trials (RCTs), controlled trials (CTs), observational, or simulation studies. Electronic databases used were CAB Abstracts, Environment Complete, BIOSIS previews, and the Web of Science. Retrieved studies were screened in two independent stages by two independent reviewers.

Results and Discussion: Five thousand one hundred and ninety-eight studies were retrieved from the database search. After the two-stage screening process, 25 studies were considered relevant and included in the review. In total, 21 studies were CTs, RCTs and observational studies, and four were simulations. There was consistent evidence proving that RG benefits plant productivity. However, the benefits of soil health and GHG emissions varied depending on the specific parameters measured. There was minimal evidence of the impact on plant diversity. More well-executed RCTs are needed to provide reliable evidence on the magnitude of the benefit of RG.

Conclusion: Rotational grazing benefits plant productivity, total health soil score, vegetation cover, water dynamics, and nutrient availability. Also, RG was shown to reduce or be neutral to GHG emissions.