UNIVERSITY OF SASKATCHEWAN
College of Agriculture and Bioresources
AGBIO.USASK.CA

Sustainable Livestock Production Systems in Saskatchewan: Challenges and Opportunities

Flavia van Cleef, Ph.D.
Integrated Forage Management and Utilization Chair
Departments of Plant Science & Animal and Poultry Science

Seminar Series
March 2025

UNIVERSITY OF SASKATCHEWAN
College of Agriculture
and Bioresources
AGBIO.USASK.CA

Land Acknowledgement

I acknowledge that I live and work on Treaty 6 Territory and the Homeland of the Métis. We pay our respect to the First Nations and Métis ancestors of this place and reaffirm our relationship with one another.

Sustainability

United Nations

“Meeting the needs of the present without compromising the ability of future generations to meet their own needs”

United Nations, 1987

SUSTAINABLE DEVELOPMENT GOALS

What does sustainability mean to you?

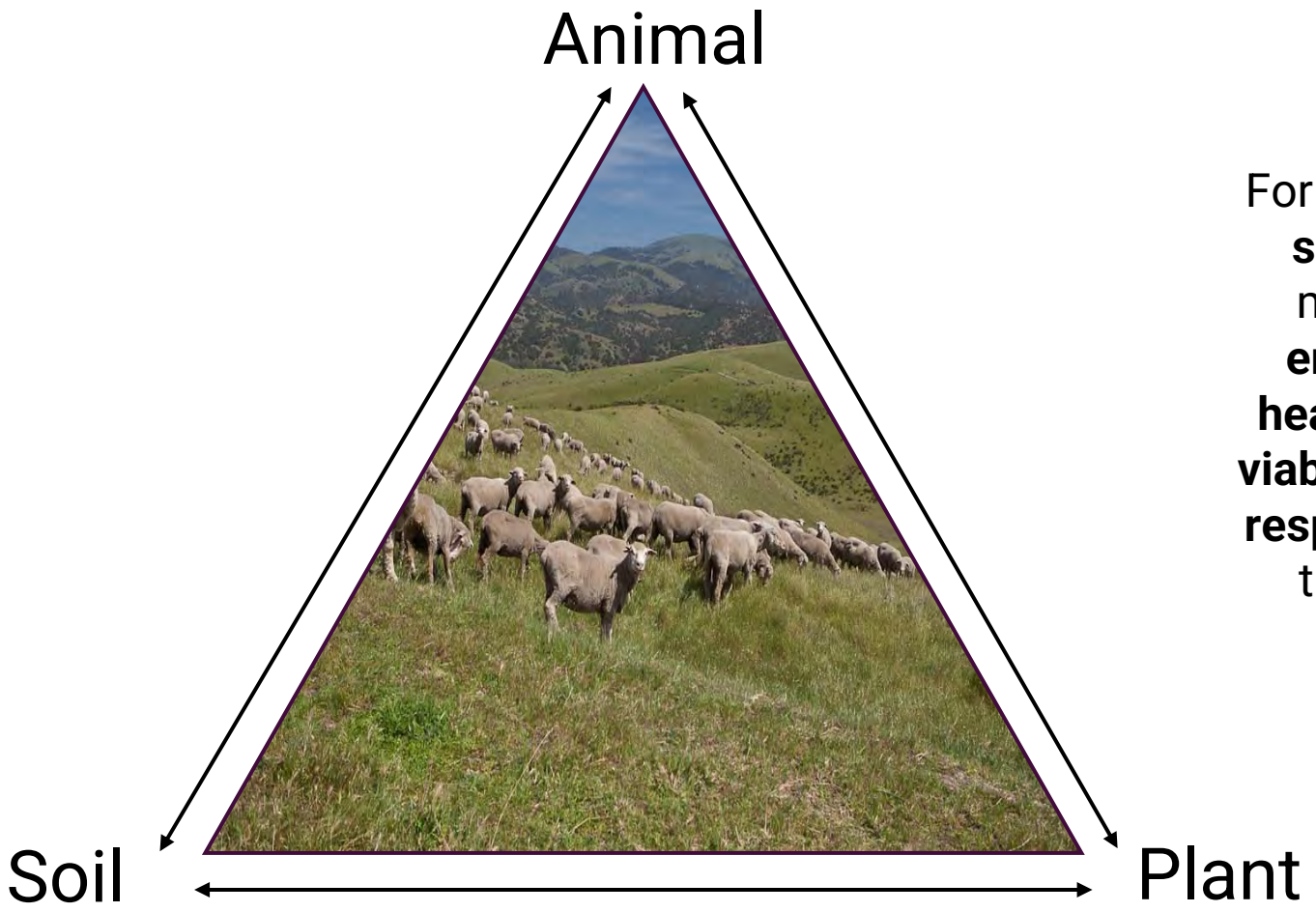
💡 **At Home:** How do you reduce waste, save energy, and make eco-friendly choices? Recycling? reusing water?

👨‍👩‍👧 **Within Your Family:** How do your family values and habits promote sustainability? no unnecessary purchases?

🏢 **At Work:** How does your workplace contribute to environmental, social, and economic sustainability?

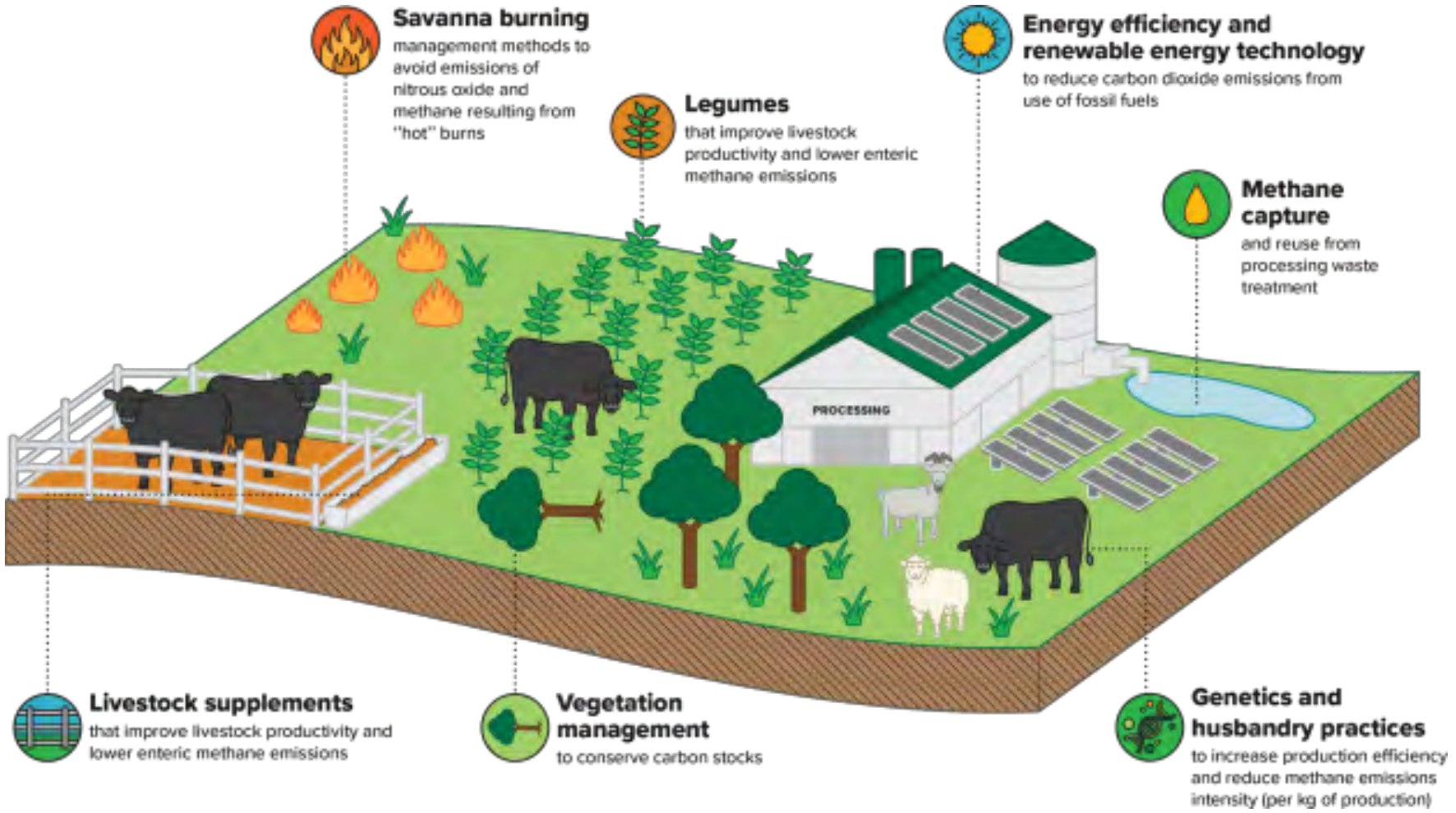
🚜 **On Your Farm:** How do you manage soil, water, and livestock to ensure long-term productivity and environmental health? Is it costly?

Farmers can do it: grow smarter, graze better, and sustain the land for future generations



For a system to be **sustainable**, it must balance **environmental health, economic viability, and social responsibility** over the long term

Good practices that lead to a more sustainable forage-livestock system

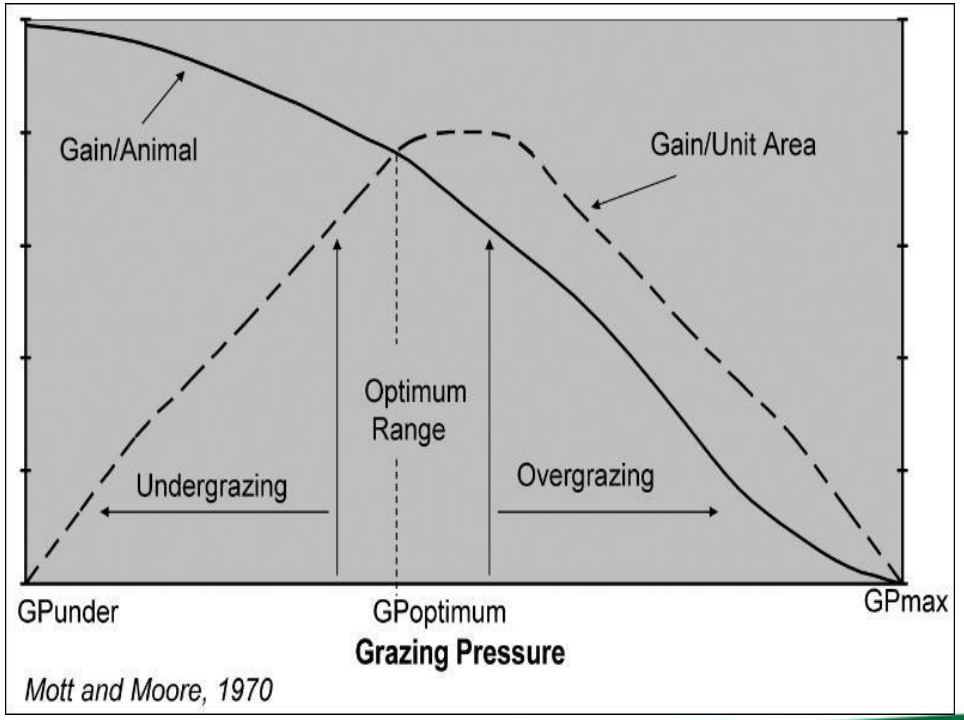


Collaboration with researchers and extension professionals helps build a more sustainable system

- New forage varieties
- Grazing models
- Climate adaptation
- On-farm trials and demonstration projects
- Soil and forage testing
- Technology
- Funding and policy support
- Knowledge sharing and networks

Collaboration with researchers and extension professionals helps build a more sustainable system

Grasses and grazing animals rely on each other → human controls it when under rotational grazing



Researcher will help:
Estimation of variables
Defining species to be used
Best moment to move animals
Number and size of paddocks
Animal category

Farmer:
Will control grazing behavior
Recordkeeping
Fencing moving/setting

Collaboration with farmers helps build a more robust research

Researchers bring valuable insights into soil health, climate resilience, animal performance, and pest management, while farmers provide hands-on experience and knowledge of local conditions.

Which rotational grazing is best for you? Farmer’s decision

1. Slow Rotational Grazing: Moves every few weeks/months.
2. Planned Rotational Grazing: Moves every 3-10 days.
3. Intensive Grazing: Moves every 1-4 days.
4. Mob Grazing: Very high-density, multiple moves per day.
5. Adaptive High-Stock Density Grazing: Adjusts to conditions.

Integrated Forage Management and Utilization Research Program Overview

- Multispecies pastures
- Grazing trials
- Small plots trials
- Animal preferences
- Toxicity of plants
- Native pastures
- Irrigation for mitigating drought effects
- Alternative feeds for winter periods

There are different ways to make your farm production more **sustainable**, and it typically involves adopting better **management** practices

Small plots x grazing trials

Small plots x grazing trials

Small plots x grazing trials

Animal Behavior

Composition of forages

Nutritional value x quality of forage

↓ CHO, fiber, protein, minerals

↓ Nutritional content, digestibility and acceptability

Botanical composition of pastures
Herbage allowance
Carrying capacity
Secondary compounds (anti nutritional effect)
Protein and fiber fractions → digestibility
Bloat x anti-bloat

Multispecies pastures

Frothy bloat is a real problem when grazing legumes


Silvopasture

Silvopasture

Climate Compatibility: While the harsh winters may limit the types of tree species that can be used, several hardy species such as **poplar, spruce, and pine** are well-suited to the region. During the warmer months, the shade provided by trees can offer relief to grazing livestock, particularly in the hotter parts of the summer, reducing heat stress and improving animal welfare.

Water Management: Silvopasture can improve water retention in soils by increasing organic matter and reducing evaporation

Diversification of Income: multiple streams of income: livestock production, timber or wood products, and even non-timber forest products like berries, mushrooms, or honey from pollinators attracted to the trees.

Improved Forage Production: The shade from trees can reduce the risk of **heat stress** on cattle, allowing them to graze longer and more effectively during hot summer months.

Cost-Effective Pasture Management: Integrating trees into pastureland can reduce wind erosion and protect against soil degradation, which could help lower costs associated with land reclamation or maintaining soil health. It also adds a layer of protection against extreme weather, which has become increasingly common in Saskatchewan due to climate change.

•**Carbon Sequestration**: The trees in a silvopasture system can help sequester carbon dioxide, contributing to climate change mitigation efforts.

Silvopasture
Challenges and Considerations

Tree Selection: The harsh winter temperatures and short growing season mean that only certain types of trees will thrive. Selecting the appropriate species that can withstand both cold temperatures and the grazing pressure from livestock is critical.

Management Complexity: Silvopasture requires careful planning and management to balance the needs of trees, livestock and forage.

Initial Investment: Establishing a silvopasture system, including planting trees, can involve higher upfront costs compared to traditional grazing systems.

Silvopasture

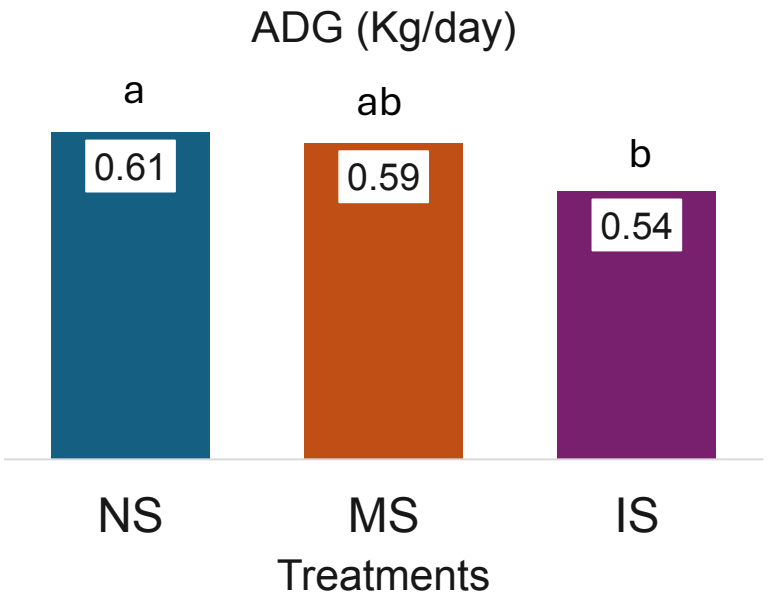
CSIRO PUBLISHING

Animal Production Science
https://doi.org/10.1071/AN20317

Physiological and behavioural responses of sheep grazing in a tropical silvopastoral system

Flavia de Oliveira Scarpino van Cleef[A,B,E], *Eric Haydt Castello Branco van Cleef*[A,C], *Daniel Jordan de Abreu Santos*[A], *Claudia Maria Herédias Ribas*[D], *Vanessa Zirondi Longhini*[A] *and Ana Claudia Ruggieri*[A]

[A]Animal Science Department, São Paulo State University, School of Agricultural and Veterinary Sciences, Via de Acesso Prof. Dr Paulo Donato Castellane, s/n, Jaboticabal, SP 14884-900, Brazil.
[B]Present address: North Florida Research Center, University of Florida, 3925 Highway 71, Marianna, FL 32446, USA.
[C]Present address: Federal University of Triângulo Mineiro, Av. Rio Paranaíba, 1295, Iturama, MG 38280-000, Brazil.
[D]Department of Pathobiology and Veterinary Theriogenology, São Paulo State University, School of Agricultural and Veterinary Sciences, Via de Acesso Prof. Dr Paulo Donato Castellane,



NS = No shading
MS = moderate shading
IS = intense shading

Water needs – drought tolerance

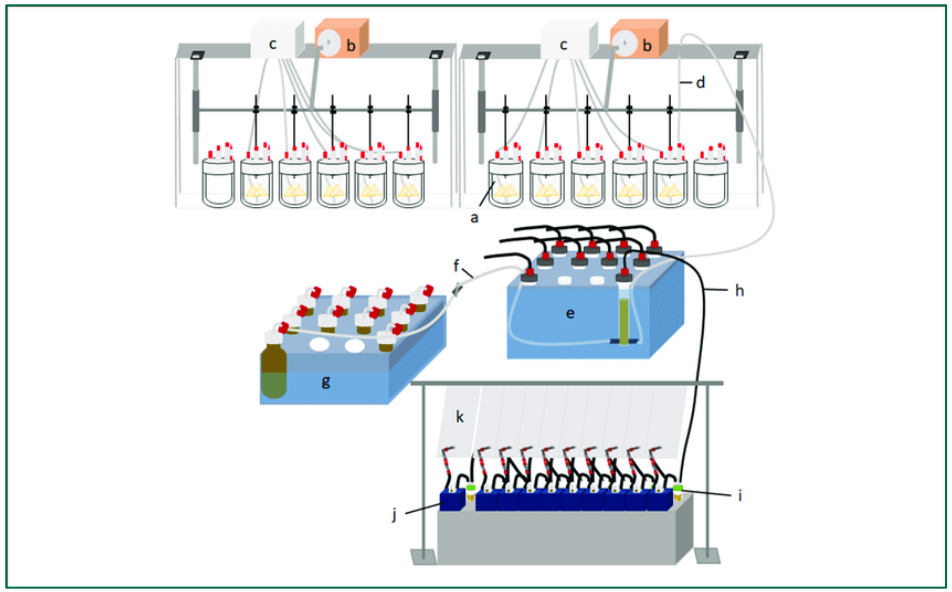
Alternative feedstuffs

- Is it possible to use pellets?
- And silage and hay?
- Feasible? Let’s calculate!

Greenhouse trials

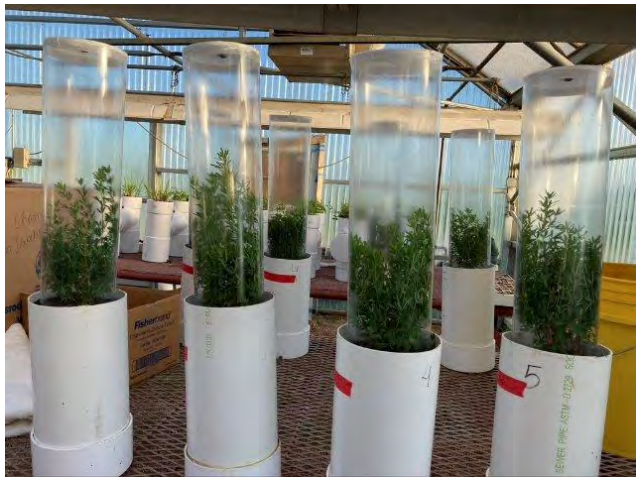
Greenhouse gases

Technologies available

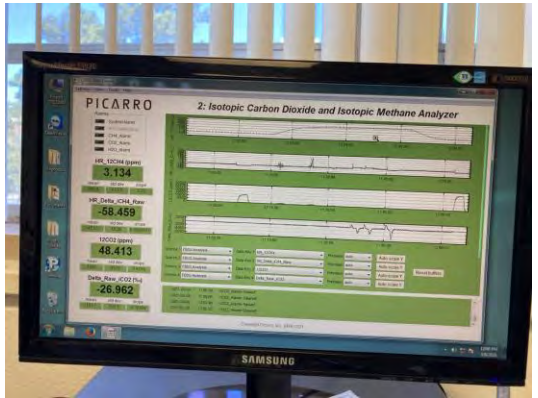


Schematic diagram of the Rusitec set up with the 12 fermenters

doi: 10.3389/fmicb.2022.889618



CROP DEVELOPMENT CENTRE
USASK



Knowledge Gaps

- How to increase productivity of the system (animal – plant – soil) without compromising feasibility of the production?
  - Grazing management
  - Costs
- How to prepare for adverse conditions → drought?
  - Is there a chance for irrigation systems by Saskatchewan farmers?
  - What are the costs?
- How to react to adverse conditions
  - Drought tolerance of species selected
  - Keep productivity high
  - Forage establishment and persistence
  - Grazing management

BCRC
BEEF CATTLE RESEARCH COUNCIL

Saskatchewan

SCA
SASKATCHEWAN
CATTLEMEN'S ASSOCIATION

GIFS | GLOBAL INSTITUTE FOR FOOD SECURITY

Dr. Flavia van Cleef

Assistant Professor and IFMU Chair

College of Agriculture and Bioresources

University of Saskatchewan

flavia.vancleef@usask.ca