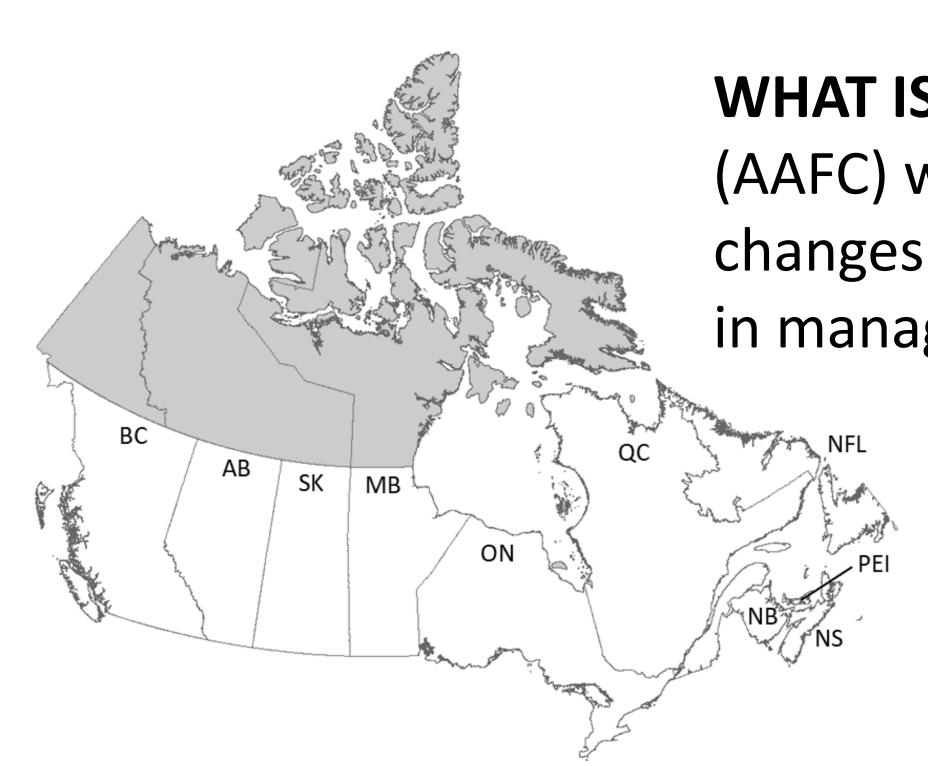
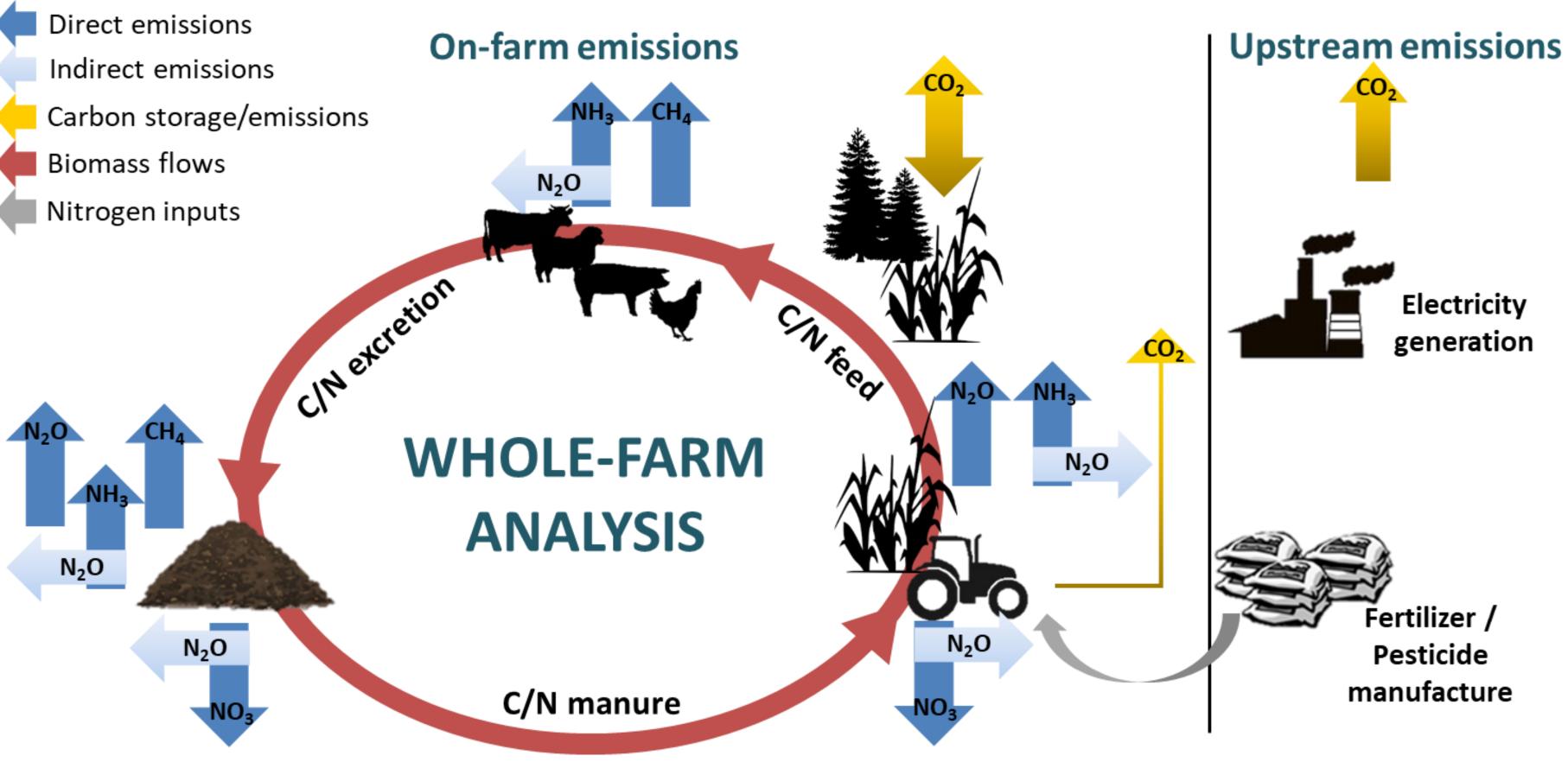


Presented at the First International Forum on Agroecosystem Living Labs, October 4-6, 2023, Montréal, QC, Canada **Sarah J. Pogue^{1*}**, Roland Kröbel¹, Aaron L. McPherson¹, Pamela Mantle¹ ¹Agriculture and Agri-Food Canada, Lethbridge Research and Development Centre, 5403 1 Ave S, Lethbridge, AB T1J 4B1; *Corresponding author: <u>sarah.pogue@agr.gc.ca</u>



Holos V4 covers all ten Canadian provinces and accounts for all GHG emissions from crop and livestock components as well as from farm machines and infrastructure. Holos V4 is aligned with Canada's National Inventory Report (ECCC 2022) on GHG emissions.



HOLOS V4 – WHO CAN USE THE MODEL?

Farmers to explore:

- the effects of management changes
- the potential to earn carbon credits
- economic gains/losses

Researchers/academics/students for:

- project/degree goals
- training/education

Policy-makers to assess: provincial GHG reduction targets • farm income and food security agricultural sustainability



Agriculture and Agri-Food Canada

Agriculture et Agroalimentaire Canada

Holos Version 4: A Whole-Farm Model for Estimating Greenhouse **Gases and Soil Carbon IS A SIGNIFICANT UPGRADE FROM**

WHAT IS THE HOLOS MODEL? – Holos V4 is Agriculture and Agri-Food Canada's (AAFC) whole-farm model to estimate greenhouse gas (GHG) emissions and changes in soil carbon from agricultural lands in Canada in response to changes in management practices.

Fig. 1 Overview of the greenhouse gas emissions and soil C estimates provided by Holos V4 for Canadian cropping and livestock systems



Food processors/ supermarkets to allow: sales/branding/quality assurance



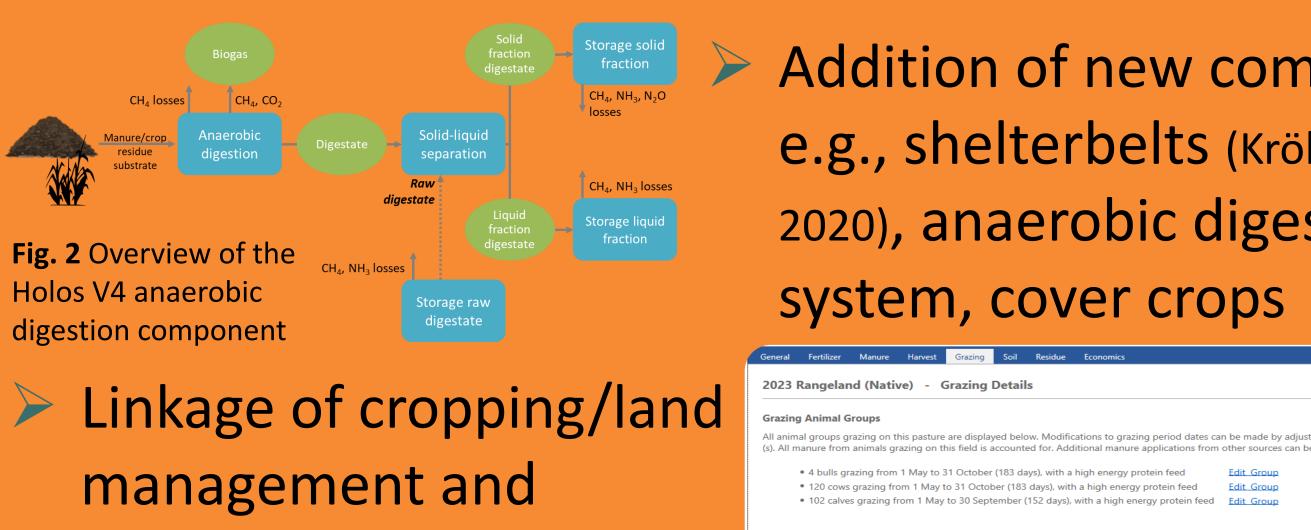
Consultants to: • meet their clients' needs

¹Soil Landscapes of Canada (<u>https://sis.agr.gc.ca/cansis/nsdb/slc/index.html</u>); ² NASA POWER Data Access Viewer (<u>https://power.larc.nasa.gov/data-access-viewer/</u>); ³ Introductory Carbon Balance Model; ECCC (2022) National Inventory Report 1990 –2020: Greenhouse Gas Sources and Sinks in Canada; IPCC (2019) 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Published: IPCC, Switzerland; Kröbel R. et al. (2020) Front Environ Sci 8: 149; Martel M. et al. (2021) J Hydrol: Reg Stud 36:

Move from ecodistrict- to SLC¹ polygon-level calculations, with SLC soils data and daily climate data from NASA²

Move from single- to multi-year soil Carbon modelling strategy C model (IPCC Tier 2 and ICBM³); Carbon concentration option for custom initial soil C value

Methodologies largely align with ECCC (2022) and IPCC (2019); Tier 2 approaches for **GHG** emissions from livestock and manure, where possible



livestock components

- >Improved perennial systems and grazing model
- Regional 'representative' model beef farms
- Cover crop mixes/blends

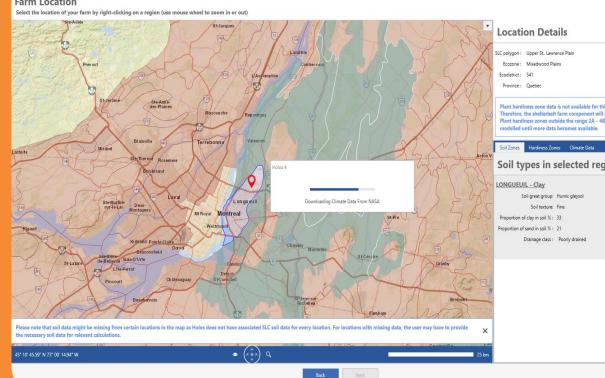
Wetland component to estimate GHG emissions and soil C changes



06 IPCC Guidelines for Nationa

Greenhouse Gas Inventories

Edited by Eduardo Calvo Buendia, Kiyoto Tanabe, Andrej Kranjo Baasansuren Jamsranjav, Maya Fukuda, Sekai Ngarize, tira Osako, Yurii Pyrozhenko, Pavel Shermanau and Sandro Fede



> Addition of new components, e.g., shelterbelts (Kröbel et al. 2020), anaerobic digestion

razing on this field can be fed additional hay by clicking the 'Add Supplemental Hay' button e imported by setting the 'Source of bales' to 'Off-farm' Date **Y** Source of bales **Y** Field **Y** Number of bales **Y** Wet bale weight (kg) **Y** Moisture

HOLOS V5 – POTENTIAL FUTURE DEVELOPMENTS:

>Additional Tier 2 GHG emissions estimates for some livestock groups, e.g., NH₃ based on TAN flows for swine, sheep, minor poultry, other livestock

Water balance model based on Martel et al. (2021)