

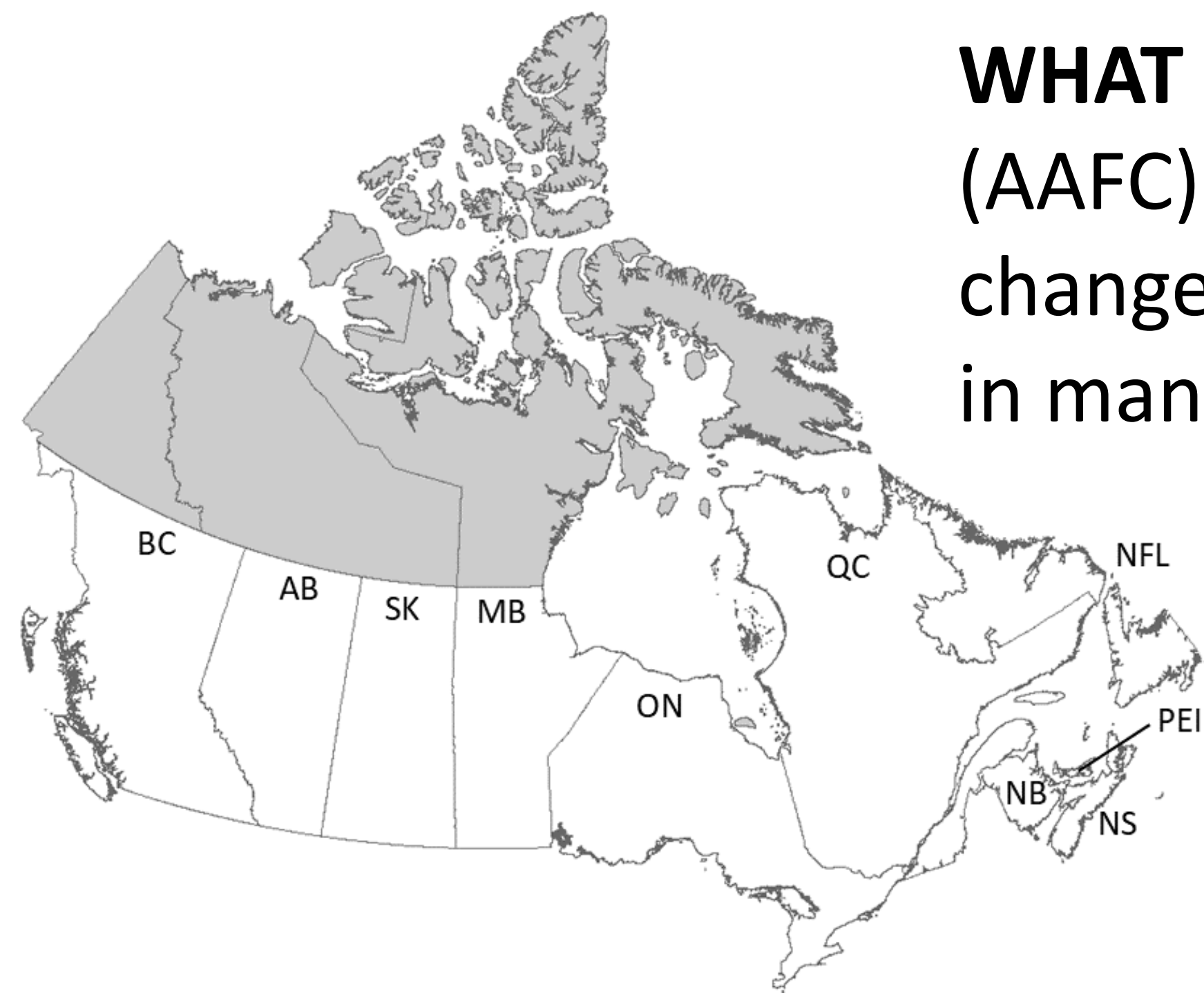
Holos Version 4: A Whole-Farm Model for Estimating Greenhouse Gases and Soil Carbon

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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.



- Direct emissions
- Indirect emissions
- Carbon storage/emissions
- Biomass flows
- Nitrogen inputs

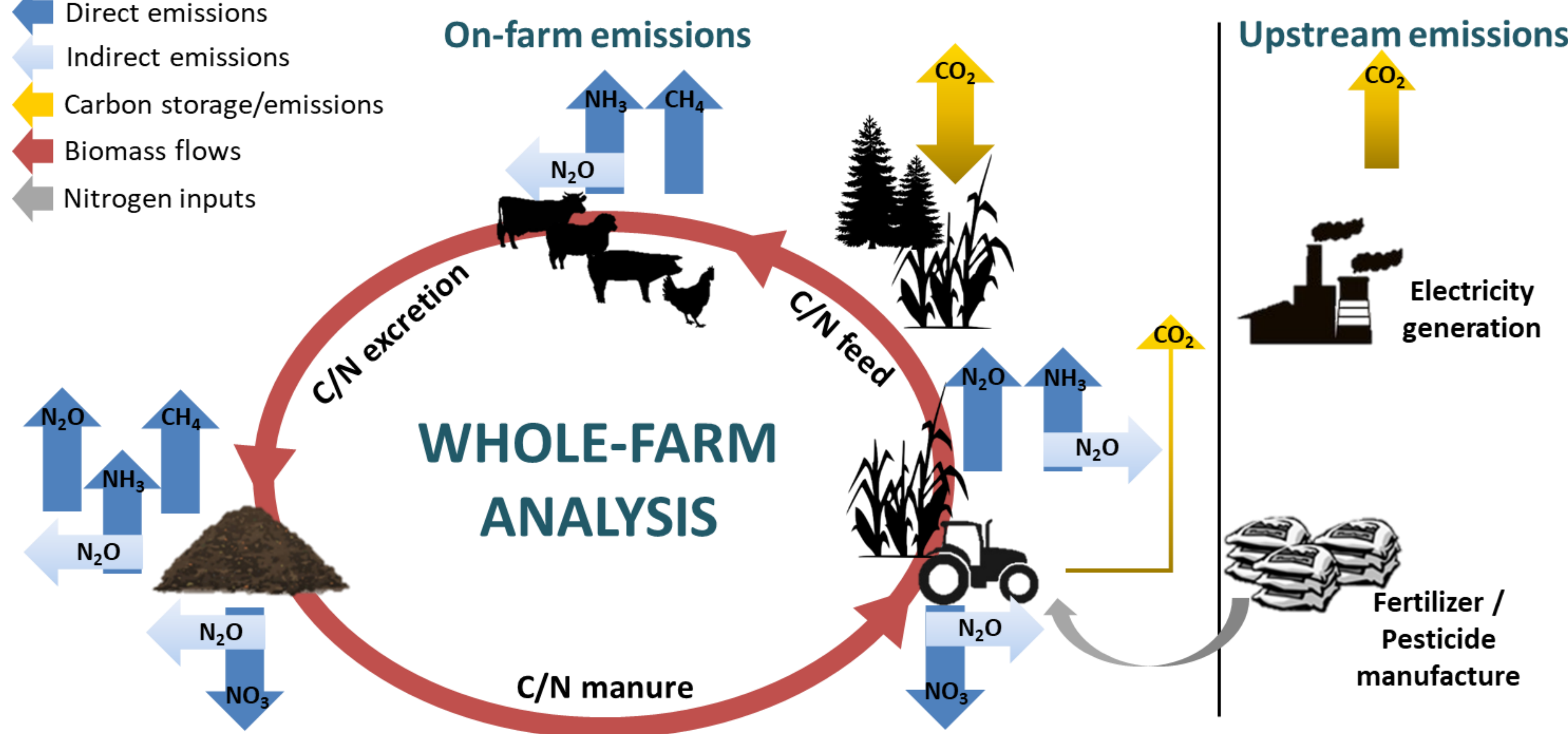
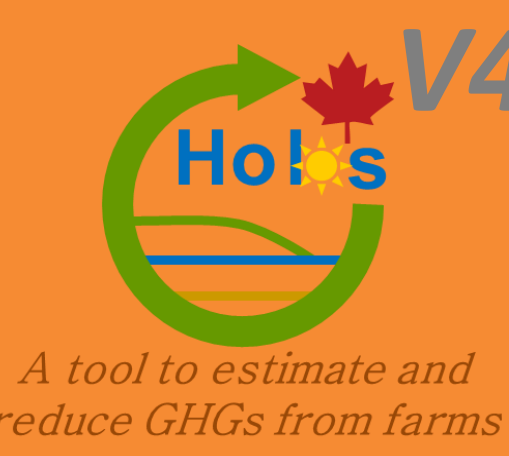


Fig. 1 Overview of the greenhouse gas emissions and soil C estimates provided by Holos V4 for Canadian cropping and livestock systems

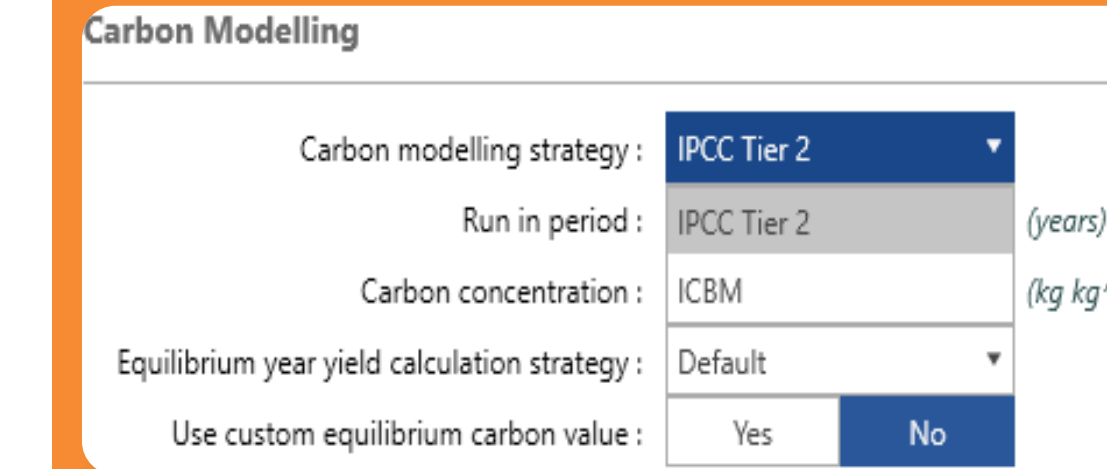
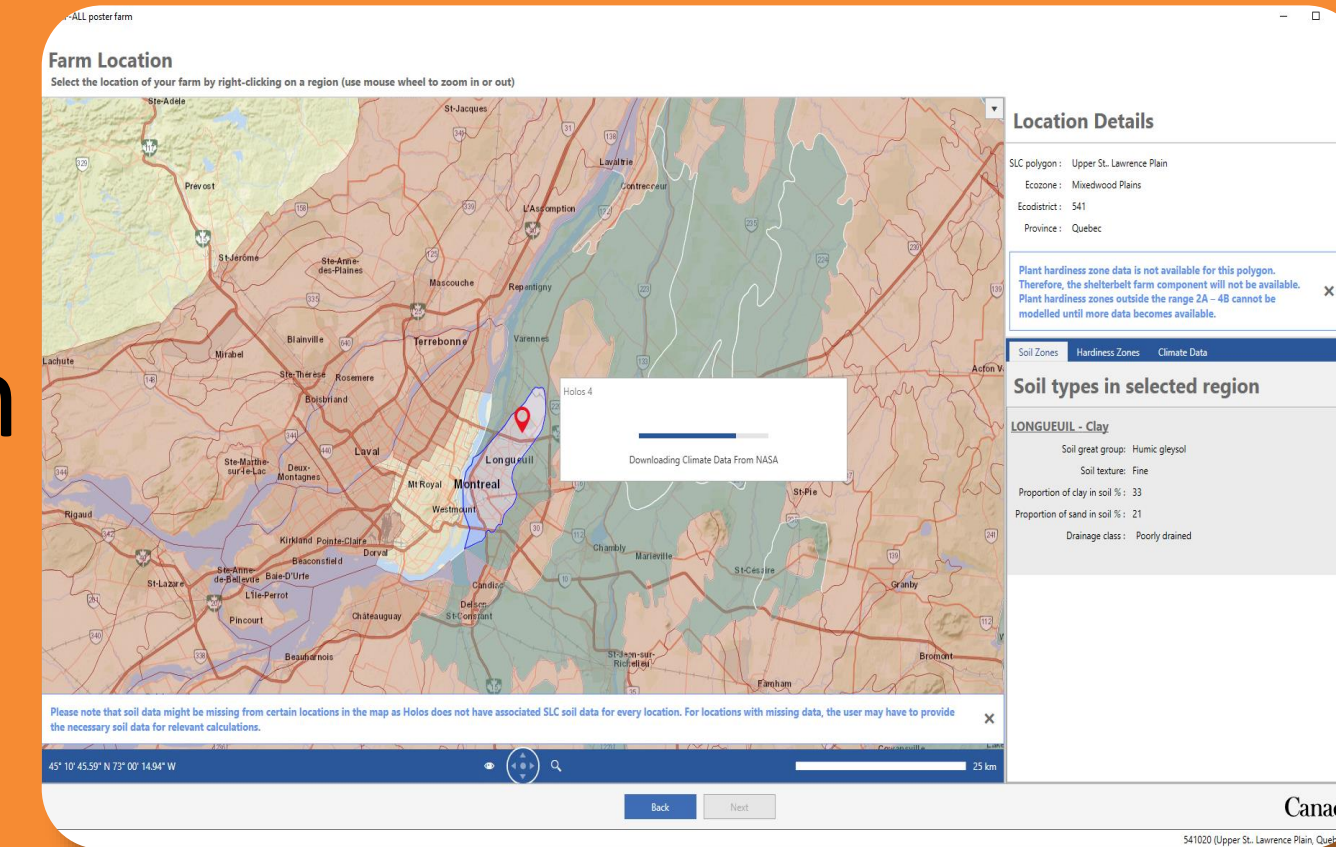
Holos V4 covers all ten Canadian provinces and accounts for all GHG emissions from crop and livestock components as well as from farm machines and infrastructure. Holos V4 is aligned with Canada's National Inventory Report (ECCC 2022) on GHG emissions.



IS A SIGNIFICANT UPGRADE FROM

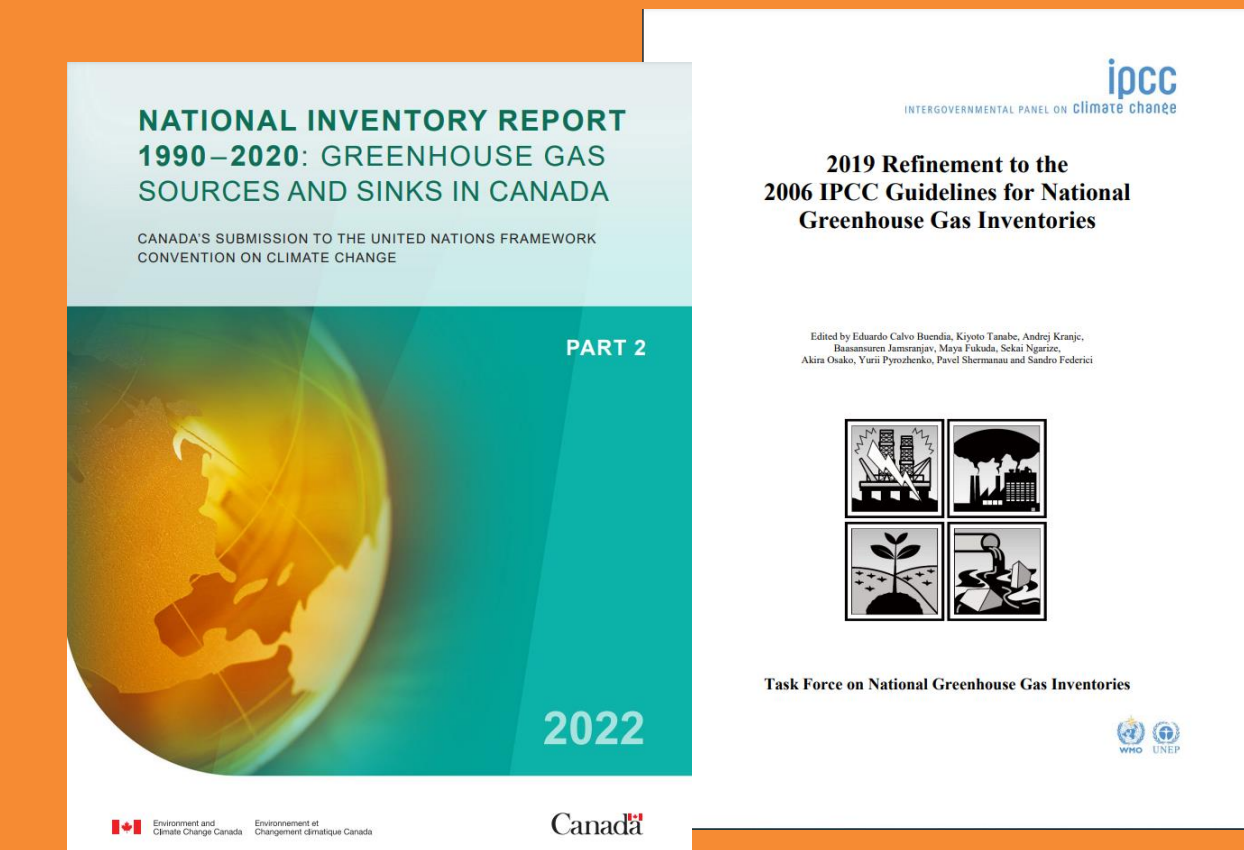


➤ Move from ecodistrict- to SLC¹ polygon-level calculations, with SLC soils data and daily climate data from NASA²



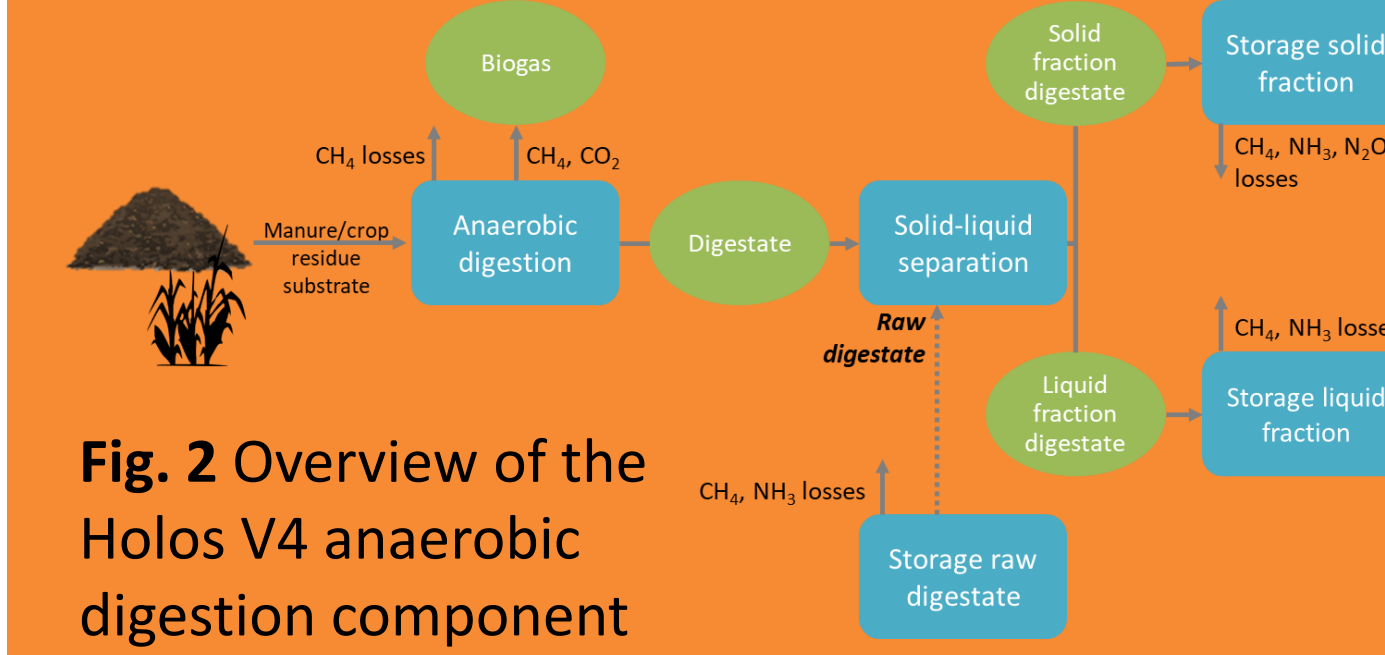
➤ Move from single- to multi-year soil C model (IPCC Tier 2 and ICBM³); option for custom initial soil C value

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

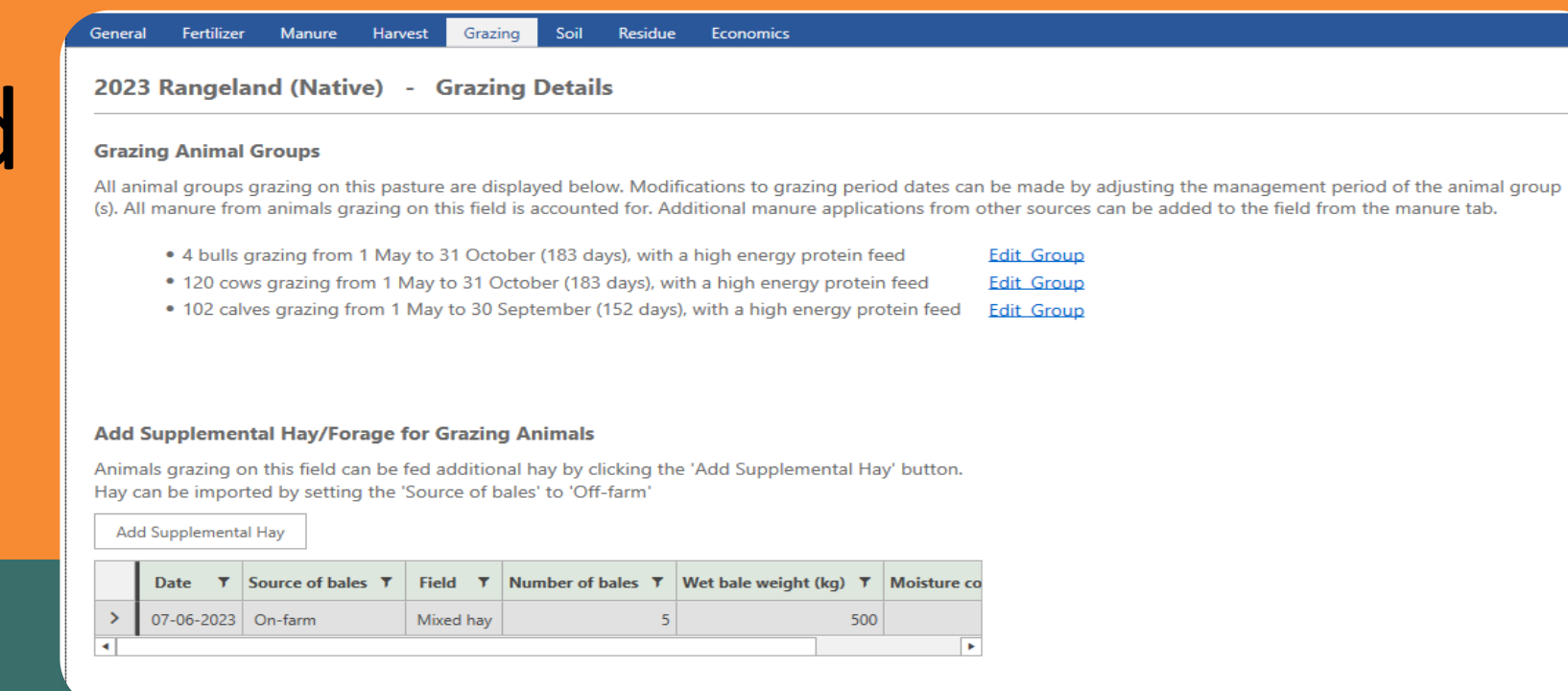


➤ Addition of new components, e.g., shelterbelts (Kröbel et al. 2020), anaerobic digestion system, cover crops

Fig. 2 Overview of the Holos V4 anaerobic digestion component



➤ Linkage of cropping/land management and livestock components



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

Food processors/ supermarkets to allow:

- sales/branding/quality assurance

Consultants to:

- meet their clients' needs

HOLOS V5 – POTENTIAL FUTURE DEVELOPMENTS:

- Improved perennial systems and grazing model
- Additional Tier 2 GHG emissions estimates for some livestock groups, e.g., NH₃ based on TAN flows for swine, sheep, minor poultry, other livestock
- Regional 'representative' model beef farms
- Cover crop mixes/blends



Wetland component to estimate GHG emissions and soil C changes



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