DECREASING EMISSIONS AND INCREASING PRODUCTION EFFICIENCY OF BEEF CATTLE

BENEFICIAL MANAGEMENT PRACTICE (BMP) FOR GREENHOUSE GAS MITIGATION

Holos is a whole-farm modelling program for estimating GHG emissions

BACKGROUND

- Enteric methane contributes 3% of total greenhouse gases in Canada.
- Up to 78% of methane from the Canadian cattle herd is produced by the cow-calf sector, primarily because this sector feeds mostly high fiber forages which tend to produce more methane than grain-based diets.
- In addition to methane (CH_4), other GHG's produced in beef cattle production systems are carbon dioxide (CO_2) and nitrous oxide (N_2O).

WHAT SHOULD WE DO?

- Reduce GHG emissions by increasing production efficiency.

HOW DO WE KNOW THIS?

- Holos, a whole-farm model, was used to estimate GHG farm emissions of carbon dioxide, methane and nitrous oxide from beef cattle production in 1981 and in 2011- Legesse et al. 2016

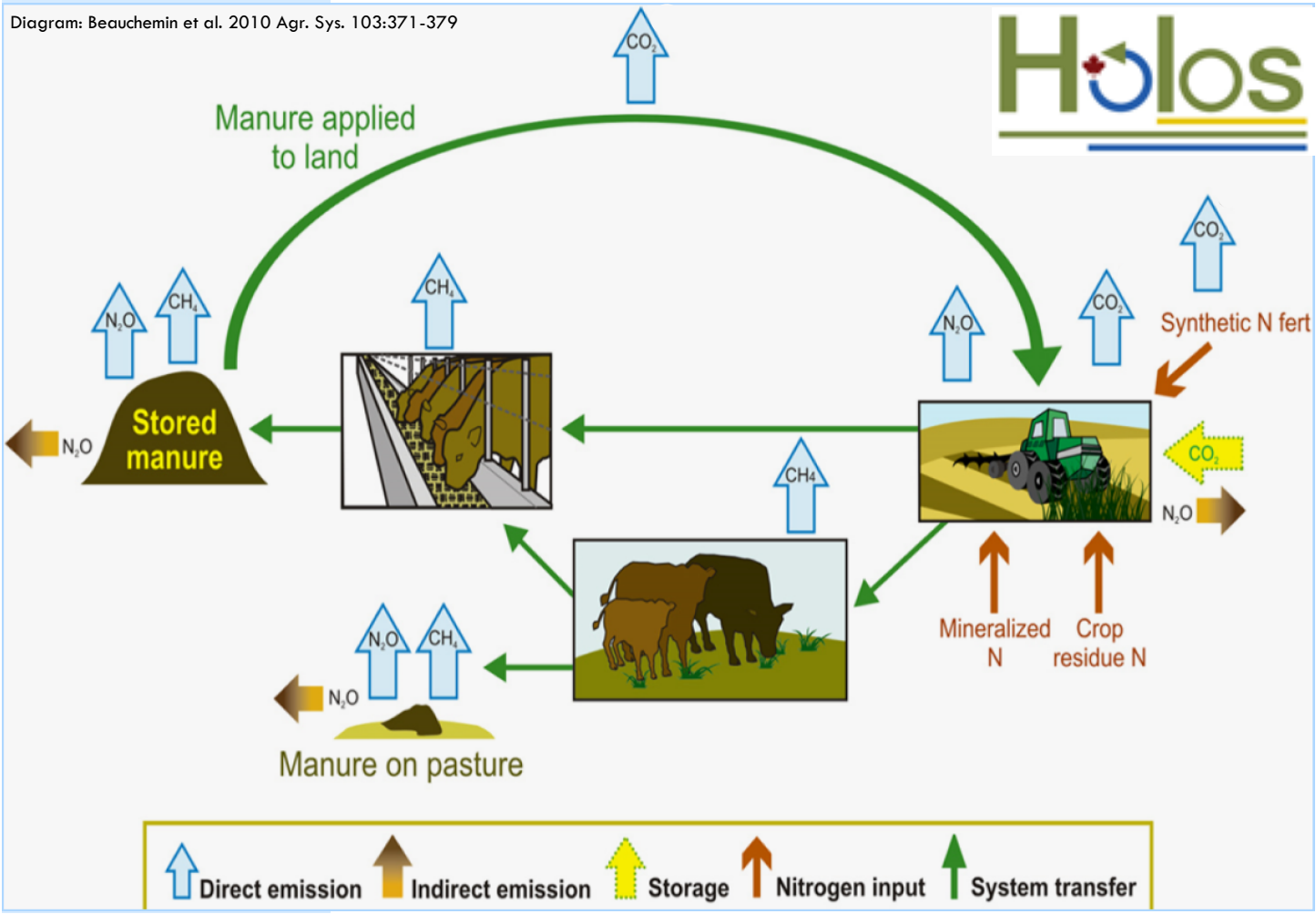

Photo: Don Flaten

WHAT IS WHOLE-FARM MODELLING?

Modelling can be used to evaluate farm practices for emission reductions

- Whole-farm modelling uses software programs to estimate GHG emissions based on information entered for individual farms.
- Using the modelling program called Holos, producers can select farm management practices that best describe their operation to estimate farm emissions and test possible ways of reducing GHG emissions by changing practices.
- Holos estimates net CO_2, N_2O and CH_4 emissions from sources which include enteric fermentation, manure management, cropping systems and energy use. Carbon storage and loss from changes in land use and management are also estimated.

SOURCES OF GHG FROM LIVESTOCK OPERATIONS INCLUDED IN HOLOS



- Using the Holos model, it was found that improved production efficiency including increased reproductive efficiency, weaning weights, steer and heifer weights, and crop yields resulted in a 15% smaller carbon foot-print in 2011 compared to 1981- Legesse et al. 2016.

HOW SHOULD WE DO IT?

- **Maintain a fertile and high producing herd**
    - Rigorously cull the breeding herd based on breeding soundness of bulls and cows.
    - Cattle produce methane during feed digestion and therefore emissions can not be completely eliminated. However, culling open cows that do not produce a calf will improve production efficiency and reduce feed costs.
    - Use opportunities to incorporate genetic improvements to increase reproductive efficiency and feed utilization.

Employ strict breeding herd culling to select the most fertile animals

Photo: John Cothren

Increase weight and percentage of live weaned calves

- **Maintain a healthy and productive calf crop**
  - Increase daily gains and percentage of live weaned calves.
  - Implement a vaccination program.
  - Develop a sound ration program to deliver required nutrients based on age and weight of animals.


Photo: Kristine Tapley

Photo: Emma McGeough

Harvesting forage for maximum digestible energy can reduce enteric emissions by approximately 5% to 10%

- **Ensure higher total digestible nutrients and dietary crude protein of feedstuffs using diets that are balanced to meet nutrient requirements**
  - Grow, harvest and feed high quality forages.
  - Formulate diets based on feed tests and feed to meet animal requirements.
  - Protein supplementation of low quality forages can reduce enteric methane emissions.
  - Cattle fed to maximize growth require less days on feed and therefore produce less methane in their lifetime.


Photo: Kristine Tapley

- **Useful tools for developing balanced rations for effective and efficient feeding**

  CowBytes version 5.3.1, Alberta Agriculture

  http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex12486

  Nutrient Requirements of Beef Cattle - Eighth revised edition (2016) http://www.nap.edu/catalog/19014/nutrient-requirements-of-beef-cattle-eighth-revised-edition

TAKE HOME MESSAGE

- By implementing the above management practices we can
  - Increase total live weight sold per unit of land and per animal.
  - Reduce the GHG emissions per kilogram of live weight produced leading to a reduction in whole farm GHG emissions and increased production efficiency.

RESEARCH HIGHLIGHTS

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Funding for production of this factsheet was provided by the Government of Canada through the Agricultural Greenhouse Gases Program of Agriculture and Agri-Food Canada.