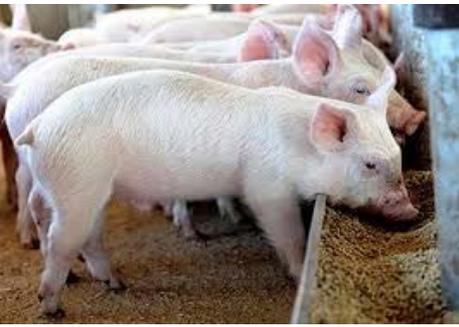


A diet formulation tool designed to reduce the environmental impact of pig production systems

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Introduction

- The production of feed and emissions from manure contribute to a large proportion of the environmental impacts arising from pig systems
- Thus it is logical to consider how different feeding strategies can be used to reduce the environmental impacts of pig production
- For monogastrics, **Global Warming Potential** is not the only important environmental impact; high protein diets and high levels nutrient excretion raise concerns regarding their contribution to **Acidification** and **Eutrophication**.

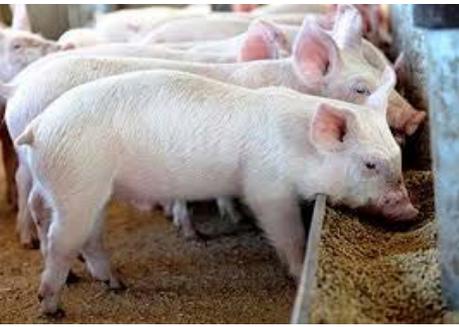


Objective



To develop methodology that enables pig diets to be formulated **explicitly for environmental impact objectives**, using a Life Cycle Assessment (LCA) approach; while overcoming the following methodological challenges:

- 1) account for environmental impacts caused by **both ingredient production and nutrient excretion**
- 2) formulate diets for **alternative environmental impact objectives**
- 3) allow flexibility to identify the **optimal nutritional composition** for each environmental impact objective



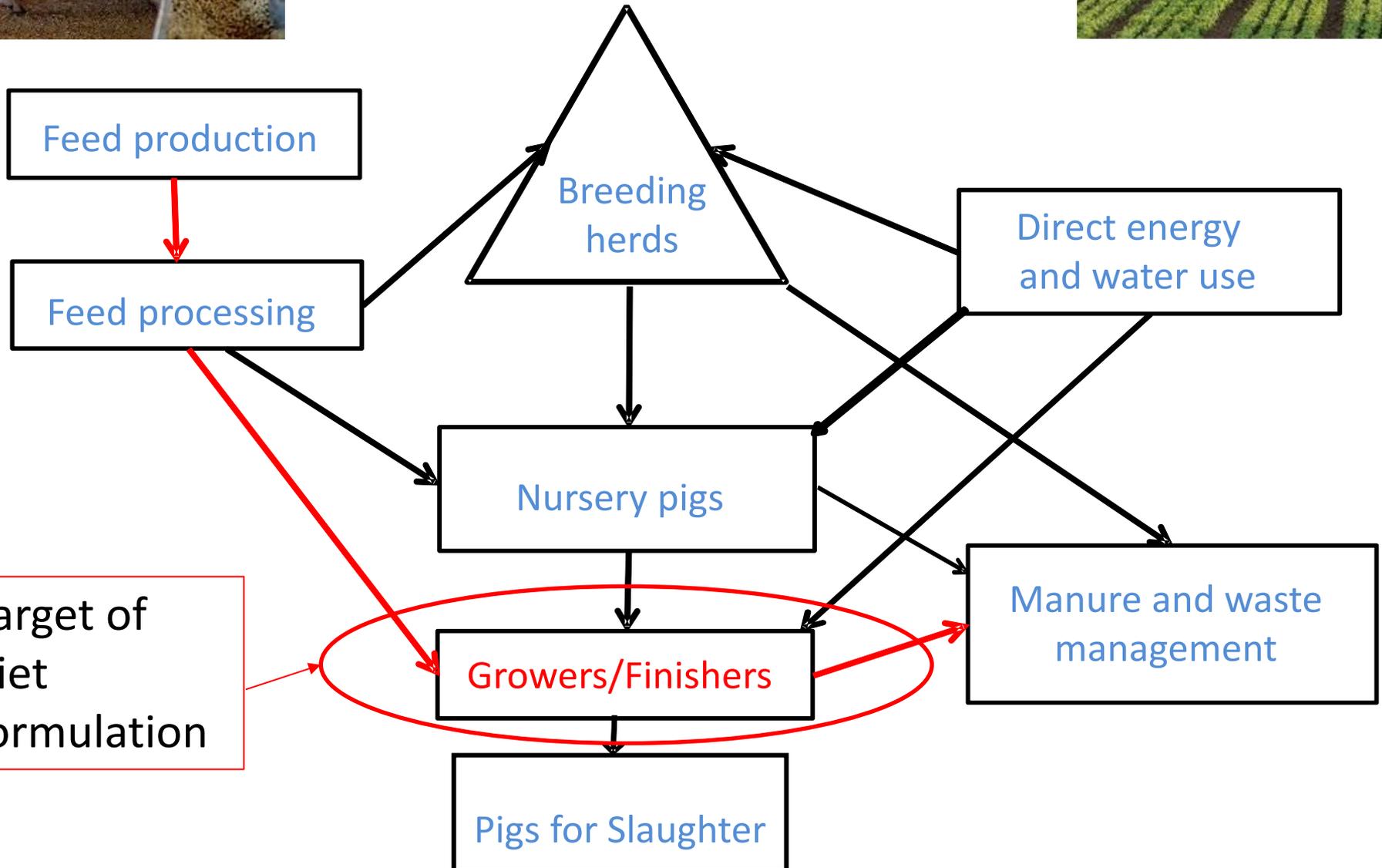
Calculating environmental impacts

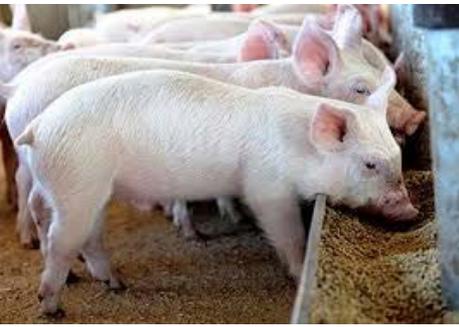


- The following environmental impact categories were considered:
 - **Non Renewable Resource Use (NRRU)** (kg Sb equivalent)
 - **Eutrophication Potential (EP)** (PO₄ equivalent)
 - **Acidification Potential (AP)** (SO₂ equivalent)
 - **Global Warming Potential (GWP)** (CO₂ equivalent)
- **EP, GWP and NRRU** all included in the FAO LEAP guidelines on pig production systems. **AP** included in the FAO LEAP guidelines on animal feed



System Description

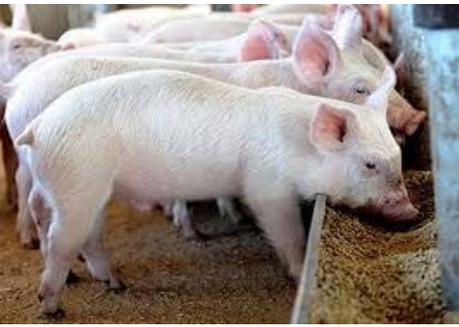




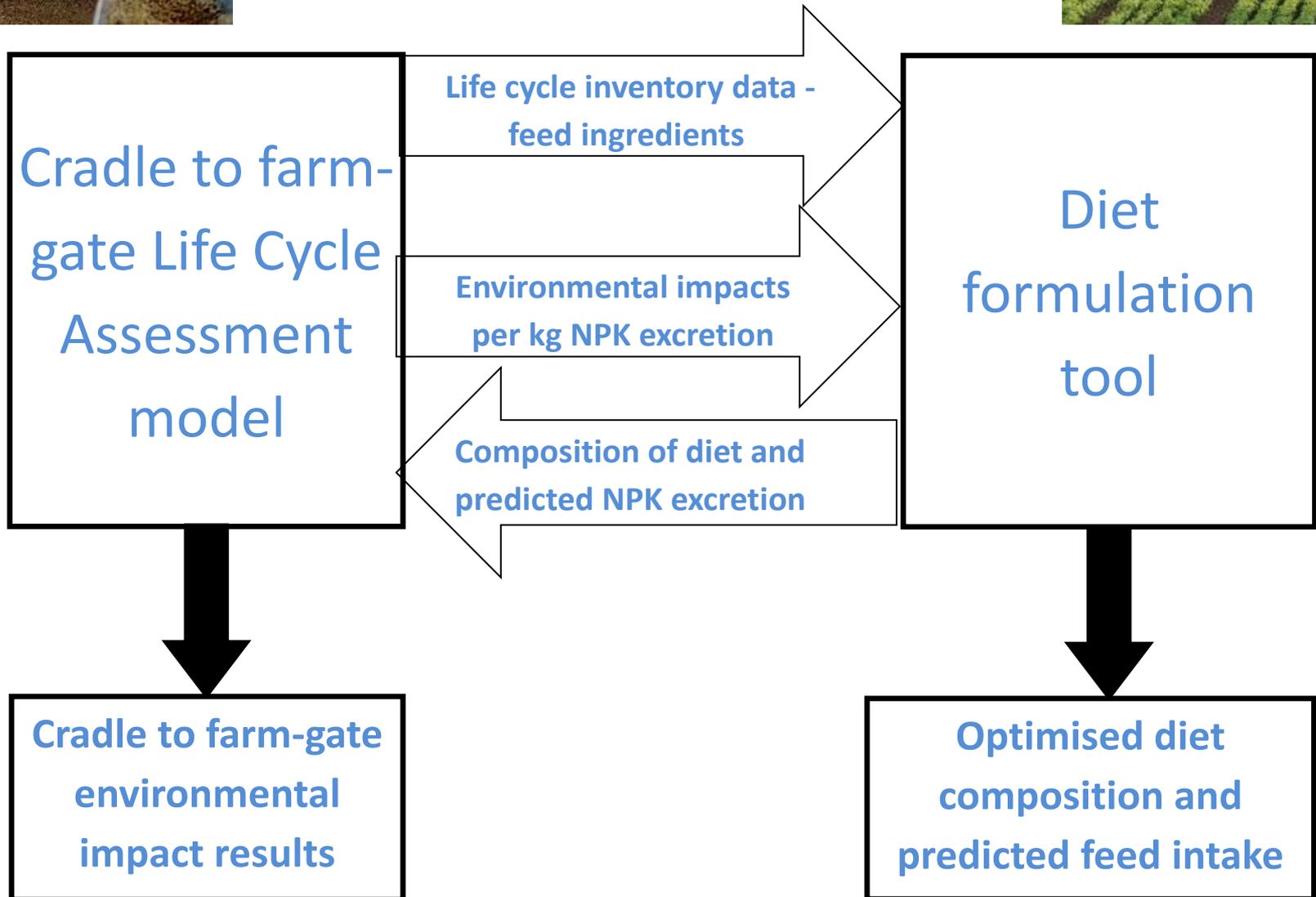
Diet formulation



- Diets were **not formulated for a fixed energy density**, but minimum nutrient to NE ratios were fixed.
- The calculations were based on constant NE intake per pig (feed consumption could vary depending on the energy content of feed)
- All diets were formulated with a cost ceiling of 130% of the least cost diet (average Canadian prices from 2015)



Linking diet formulation and LCA





Diets formulated

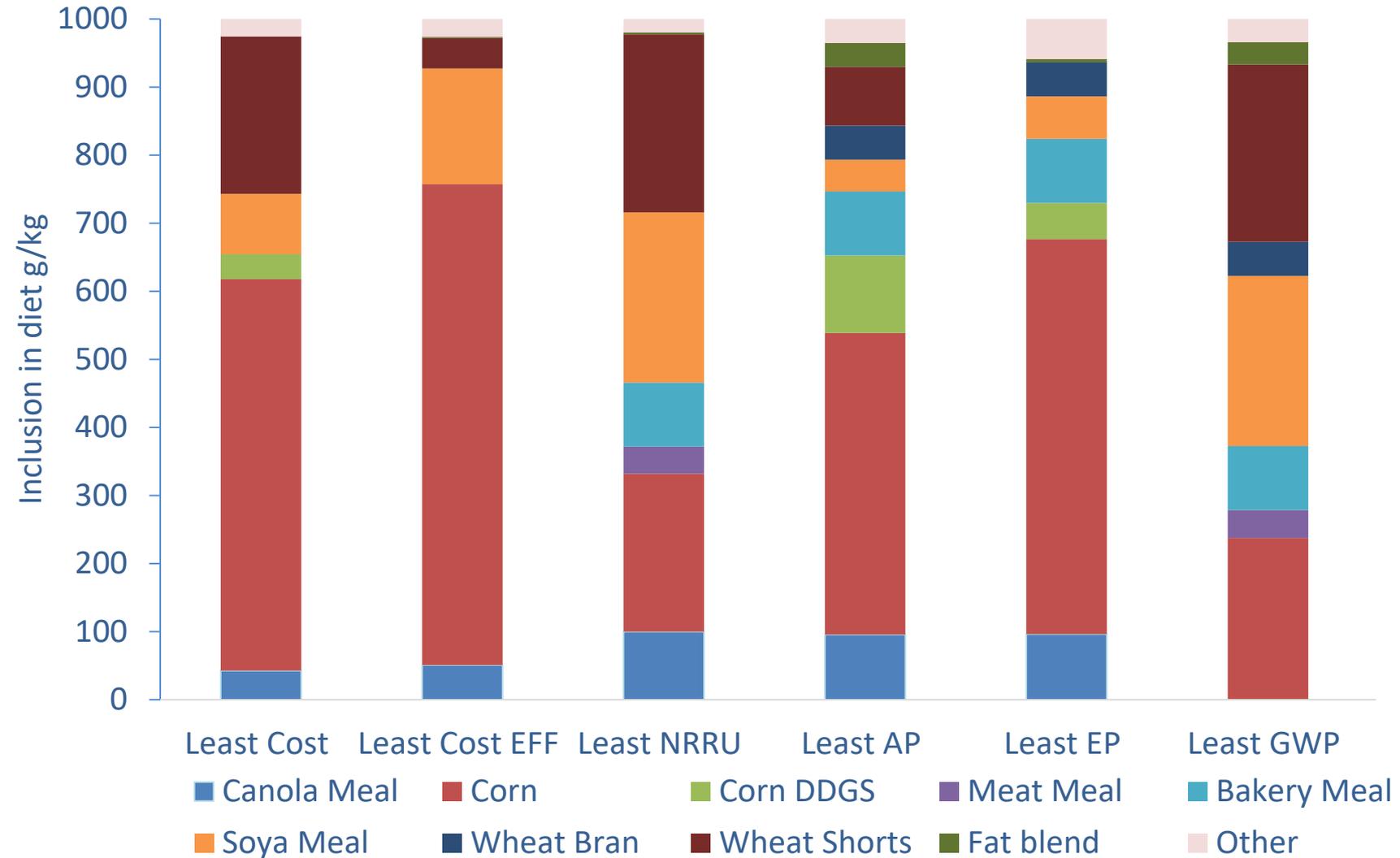


Diets were formulated for different objectives in two regions (Eastern and Western Canada):

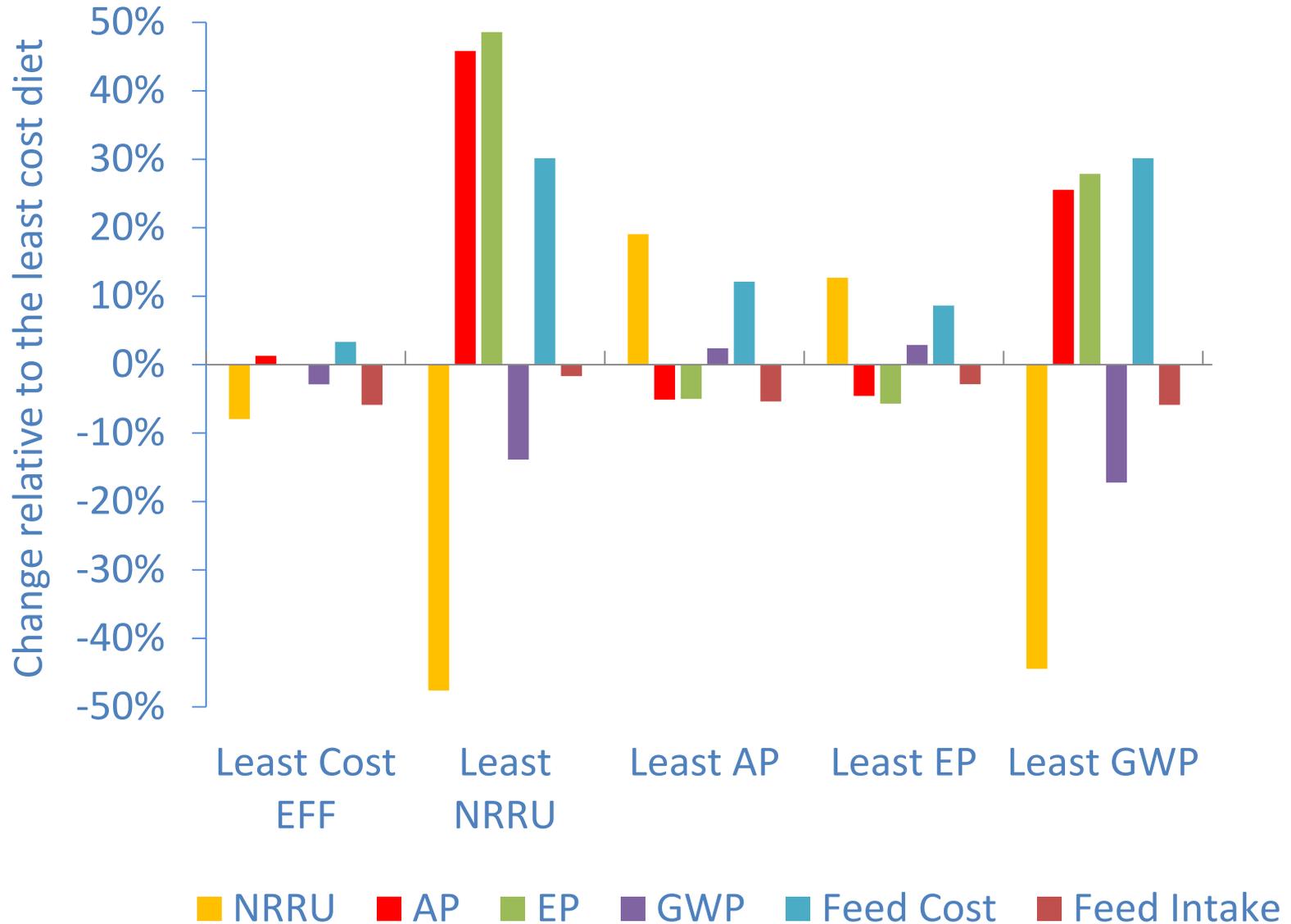
- Least Cost per kg live weight (LW) gain (**Least Cost**)
- Least Cost per kg LW gain with fixed feed energy content (**Least Cost EFF**)
- Least environmental impact in each category (**Least NRRU, AP, EP and GWP**)

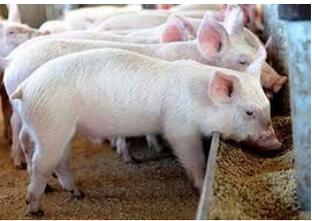


Ingredient Composition – Eastern Canada

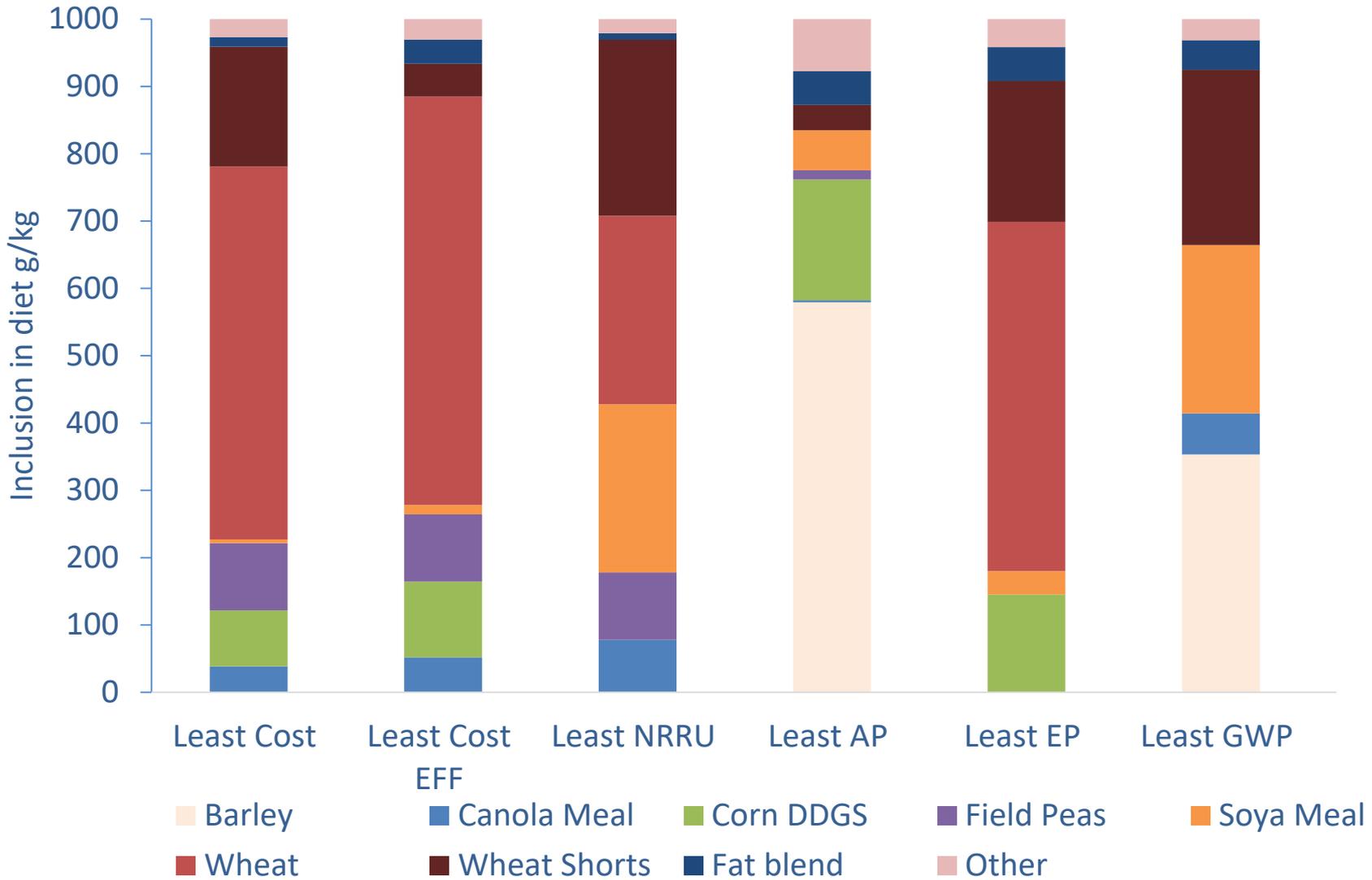


The environmental impacts, feed cost and feed intake Eastern Canada

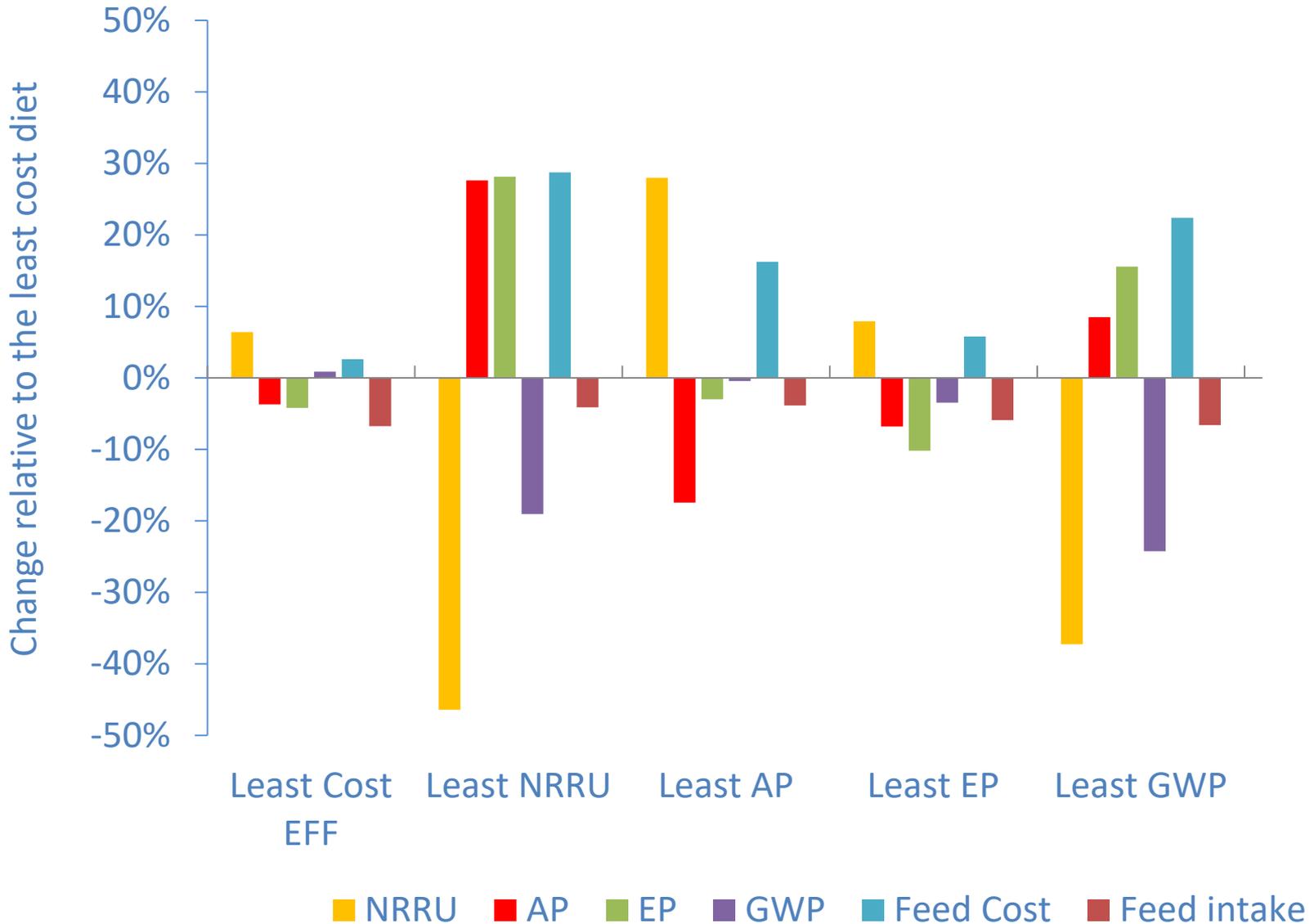


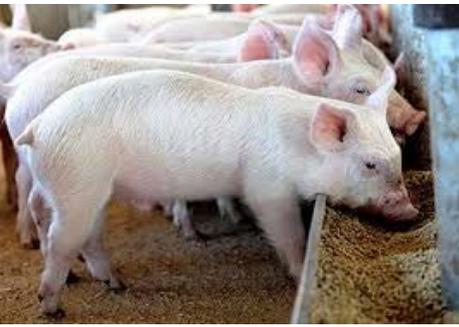


Ingredient Composition – Western Canada



The environmental impacts, feed cost and feed intake Western Canada





Conclusions



- Flexibility in the diet formulation rules allowed the tool to identify the optimum nutritional composition of the diets for a particular environmental impact.
- Relatively large reductions in NRRU and GWP were found to be possible compared to the least feed cost diet, however these came at the expense of increases in AP and EP

Thank you for your attention

Any questions?

