INTRODUCTION, GOAL & SCOPE

Canada is a leading beef-producing and exporting country. Beef production systems in western Canada are operated in two major phases: a cow-calf phase and a finishing phase. Manitoba is trying to reduce greenhouse gas (GHG) emissions from cow-calf operations through Beneficial Management Practices (BMP). Extended bale grazing (EBG) is increasingly used as a cost-effective overwintering strategy along with dry lot overwintering (DLO) operations, and was analyzed to determine whether it could be used as a BMP for GHG emission reduction. 

GOAL: Compare GHG impacts of producing a market-ready beef animal using DLO vs. EBG overwintering strategies

SYSTEM BOUNDARY: Cradle-to-farm gate. Cow-calf operations occur in Manitoba and most calves are sent for finishing to Alberta.

PRODUCTION SYSTEMS

COW-CALF OPERATIONS (Manitoba)
- Overwintering: 7 months in confinement on dry lots
- Mineral & vitamin supplements are left at dry lot
- Manure is piled, then collected and spread on hay

EXTENDED BALE GRAZING AS A GREENHOUSE GAS MITIGATING ALTERNATIVE

IN WESTERN CANADA BEEF PRODUCTION: A LIFE CYCLE EVALUATION

Kumudinie Kariyapperuma 1, Goretty Dias 1*, Matthew Wiens 2, Juanita Kopp 2, Kim Ominski 3, Steven Young 1 & Anastasia Veeramani 1

*gdias@uwaterloo.ca

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FUNCTIONAL UNIT: 1 kg live weight market-ready beef animal (605 kg) based on producing and finishing a weaned calf (250 kg) over 494 days

METHODS & TOOLS: SimPro, Holos (IPCC equations and parameters), CowBytes (feed rations)

LIFE CYCLE RESULTS AND SENSITIVITY ANALYSIS

Net GHG emissions per 7 month old weaned calf (250 kg) including soil C sequestration sensitivity analysis

Enteric and manure emissions are biggest contributors to GHGs
- EBG reduces GHG emissions by 2.1% relative to DLO for cow-calf operations & 1.3% on a cradle-to-farm gate basis (excluding C sequestration)
- Although enteric emissions increased in EBG due to colder temperatures, manure emissions decreased due to differences in manure management
- EBG − DLO with 1.5 & 14.7 kg CO₂/kg live weight of beef & with/c without carbon sequestration, respectively
- EBG − DLO with 1.2 & 14.5 kg CO₂/kg live weight of beef with & without carbon sequestration, respectively

EBG − DLO with 1.5 & 14.7 kg CO₂/kg live weight of beef & with/c without carbon sequestration, respectively

EXISTING STUDIES

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<th>Study</th>
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<th>Scope</th>
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<tr>
<td>Beauchemin et al. (2011)</td>
<td>Western Canada</td>
<td>Not including C sequestration</td>
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<tr>
<td>Verge et al. (2008)</td>
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<td>Pelletier et al. (2010)</td>
<td>US Mid-West</td>
<td>Similar boundaries &amp; assumptions</td>
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<td>Lupo et al. (2013)</td>
<td>US Northern Great Plains</td>
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FURTHER RESEARCH

- Include other impacts (e.g., eutrophication of Lake Winnipeg in Manitoba is a concern)
- Uncertainty associated with C sequestration rates and the potential for pasture and perennial hay systems to sequester carbon – crucial for understanding the impact of GHG emissions from beef production systems

REFERENCES:

KEY FINDINGS & RECOMMENDATIONS

BENEFICIAL MANAGEMENT PRACTICES
- Although cost-effective, EBG results in relatively small GHG emission reduction, particularly when uncertainties in data and IPCC emission factors are considered
- EBG has a higher potential for nutrient runoff relative to DLO, thus it is important to routinely change area that cattle bale graze on to prevent over fertilization and nutrient runoff in fields that are in close proximity to water bodies

LIMITATIONS
- Uncertainties in C sequestration rates & IPCC emission factors related to nitrous oxide dynamics
- Limited data on feed impacts on enteric emissions
- Inadequate impact assessment methods to analyze environmental trade-offs due to differences in P/N dynamics between the 2 systems

FURTHER RESEARCH
- Include other impacts (e.g., eutrophication of Lake Winnipeg in Manitoba is a concern)
- Uncertainty associated with C sequestration rates and the potential for pasture and perennial hay systems to sequester carbon – crucial for understanding the impact of GHG emissions from beef production systems

REFERENCES:

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