



# Beef Feeding and Beef Life Cycle - Alberta Protocols

## Overview:

### Carbon Offsets from Beef Operations in Alberta

This bulletin provides background and summarizes details of the Quantification Protocols for Beef Feeding (edible oils) and Beef life cycle (reducing age to slaughter). An overview of Alberta's Regulatory Framework and Offset requirements are given in the Overview document.

The Beef Feeding protocol considers the reduction of methane from enteric fermentation in cattle. The inclusion of edible oils in the diet during the finishing cycle gives rise to reduced methane emissions, providing requirements are met (see below). In order to quantify emission reductions, a comparison of the Baseline condition (no feeding of edible oils) versus the Project condition (feeding edible oils) is essential to the quantification of GHG emission reductions. This protocol does not prescribe the feeding regime for beef production. Rather, it serves as a generic 'recipe' for project developers to follow in order to meet the requirements for measurement, monitoring and GHG quantification. This Protocol quantifies emissions reductions on the basis of the mass of beef produced. Thus, the starting point for all quantification is the number and weight of cattle produced in the project.

The Beef Life Cycle protocol considers the direct and indirect reductions of greenhouse gas (GHG) emissions from reducing the slaughter age of cattle throughout the beef production supply chain (cow-calf to slaughter). This includes enteric methane emissions from calves, cows and bulls; and emissions from manure handling, storage and application. This Protocol does not prescribe the slaughter age or feeding practices for beef production. Rather, this protocol serves as a generic 'recipe' for project developers to follow in order to meet the measurement, monitoring and GHG quantification requirements. The Beef Life Cycle Protocol quantifies emissions reductions on the basis of the mass of beef produced. Thus, the starting point for all quantification is the number and weight of cattle produced in the project. Critical to the correct implementation of this protocol is being able to age verify the cattle, and trace the ownership supply chain of the animals.

## Emission Reductions from Beef Operations – What Counts?:

### Beef Feeding

The emission reductions in the Beef Feeding protocol are due to inclusion of edible oils in the range of 4% to 6% (by dry weight) of the finishing diet. While cattle are on this diet (finishing cycle), the reduction in enteric methane emissions are approximately 20%. The baseline condition would be defined as a feeding regime that does not include edible oils in the range of 4% to 6% (by dry weight) within a three year period prior to project implementation.

Under the Alberta Offset System rules, projects can claim credit back to 2002 onwards, if they meet the requirements of the system and protocols. The requirements of the system is that projects have to start after 2002, therefore, feedlot operators must prove they started feeding edible oils after 2002 to be eligible to earn credits in the Alberta Offset market. If they meet this requirement and the protocol criteria, then there is no deadline for which to access these past tonnes. If the owner of the feedlot wishes to wait a year to see how things evolve in the market, they can get involved a year from now and still gain credit back to 2002 if all requirements are met.



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For the Beef Feeding Protocol, the requirements are:

- Feeding edible oils in the range of 4 to 6% (either by oil or by seed, adjusted for oil content);
- All farms in the project are currently storing manure and applying manure or custom applying manure to land as confirmed by an affirmation from the project proponent
- All farms in the project can demonstrate a change in practice in terms of edible oils, after 2002 in the feeding regime for their cattle confirmed by operational records; and;
- The quantification of reductions achieved by the project is based on actual measurement and monitoring (except where indicated in the protocol);

NOTE: This protocol can complement the Beef Life Cycle protocol, for those that wish to feed edible oils and slaughter cattle at earlier ages.

### Beef Life Cycle:

In Canada, beef cattle on average, are slaughtered at 18 months of age, with a range of between 14 and 21 months. In order to apply this protocol, the Project Developer would need to prove that a change in practice (reduced age to slaughter) has occurred, relative to practices in the baseline (before project) operating conditions. The baseline condition would be defined as the average slaughter age of the cattle for the three years prior to project implementation.

Under the Alberta Offset System rules, Projects can claim credit back to 2002 onwards, if they meet the requirements of the system and protocols. The requirements of the system is that Projects have to start after 2002, therefore, Project Developers must prove they started changing the age of slaughter after 2002, and meet the requirements below to be eligible to earn credits in the Alberta Offset market. If they meet this requirement and the protocol criteria, then there is no deadline for which to access these past tonnes. If the Project Developer wishes to wait a year to see how things evolve in the market, they can get involved a year from now and still gain credit back to 2002 if all requirements are met.

For the Beef Life Cycle Protocol, the requirements are:

- Over the life of the cattle involved in the Project, the Project Developer has to attest that the cattle followed the broad feeding practices at the age ranges given:

**TABLE A1: Emissions Factors Based on Slaughter Age**

Emissions Factor	Slaughter Age (Months)				Equation <sup>2, 3</sup>	R <sup>2</sup>
	12 <sup>1</sup>	14 <sup>1</sup>	18 <sup>1</sup>	21 <sup>1</sup>		
EF Enteric CH <sub>4</sub>	0.43	0.47	0.68	0.86	$y = 0.162 e^{0.079x}$	0.9931
EF Manure N <sub>2</sub> O	0.0062	0.0090	0.0135	0.0249	$y = 0.0011 e^{0.1464x}$	0.9791
EF Manure CH <sub>4</sub>	0.0038	0.0048	0.0104	0.0161	$y = 0.0005 e^{0.1659x}$	0.9935

<sup>1</sup> Emission factors developed for each of these slaughter age scenarios as part of the work completed by the Beef Technical Working Group under the NOQT. The calculation of these emission factors follows the guidance from IPCC (tier 2) and is based on the feeding regimes provided in TABLE A.2.

<sup>2</sup> Equations represent best fits with the data from the analysis ensuring that the interpolation by the use equations represented a conservative approach and reflected the likely variances around the data points.

<sup>3</sup> For the equations, 'x' represents the average age of cattle at slaughter in months.



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**TABLE A2: Number of Days per Feeding Regime based on Slaughter Age**

Feeding Regime <sup>1</sup>	Slaughter Age			
	12	14	18	21
100% milk	91	91	91	91
56.6 : 43.0%, forage : milk	31	92	92	92
40 : 60% silage, concentrate (DM basis)	31	31	0	0
100% barley silage (DM basis)	0	0	212	212
grass, legume pasture	0	0	0	153
17% : 80% : 3%, silage : barley : supplements (DM basis)	212	212	153	92

<sup>1</sup> DM represents dry matter basis.

This will involve an affirmation of the Project Developer that throughout the lifecycle of the animal, the rough feeding regimes above apply.

- All cattle to be included under this protocol must have a birth date registered with Canadian Cattle Identification Agency (CCIA) confirmed by operational records;
- All farms in the project are currently storing manure and applying manure or custom applying manure to land as confirmed by an affirmation from the project developer;
- All farms in the project can demonstrate a change in practice in terms of the age of slaughter of their cattle confirmed by operational records; and
- The quantification of reductions achieved by the project is based on actual measurement and monitoring (except where indicated in this protocol) as indicated by the proper application of this protocol.

Additional guidance is given in the Protocols found on [www.carbonoffsetsolutions.ca](http://www.carbonoffsetsolutions.ca).

### References:

Alberta Quantification Protocol for Beef Feeding. at: <http://www.carbonoffsetsolutions.ca>;

Alberta Quantification Protocol for Beef Life Cycle at: <http://www.carbonoffsetsolutions.ca>



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