ONTARIO PORK ENVIRONMENTAL LIFE CYCLE ASSESSMENT (LCA) – GOAL AND SCOPE

1.1 INTRODUCTION

As part of this first Social Responsibility Report, a **simplified environmental life cycle analysis** (LCA) was carried out to measure the carbon and water footprint of pork production in Ontario.

This methodological appendix summarizes the scope, methodologies, data and assumptions used to realize this LCA.

1.2 OVERVIEW OF THE ASSESSMENT

A LCA is a systematic, quantitative assessment used by industries to gauge environmental performance. It is guided by the International Organization for Standardization (ISO 14040/14044) and can evaluate a broad spectrum of impacts. For food production this would include water use, energy use, greenhouse gas emissions and land use. LCA is part of a set of tools that characterize sustainability issues, along with social and economic assessments. LCA is a tool to inform decision-making, prioritize resources and support marketing, communications and education efforts. The important contributors to impacts can be measured and used to prioritize investments to improve environmental performance.

Figure 1-1 : Typical life cycle stages in LCA

SCOPE OF THE ASSESSMENT

The LCA conducted in this project covers stages required to produce 1 kg of pork carcass weight and is based on average data representative of pork production in Ontario. The assessment encompasses the entire pork production chain from feed production to the final processing at the slaughtering house – the retail and consumption phases are outside the scope. Main life cycle phases are presented in figure 1-2.

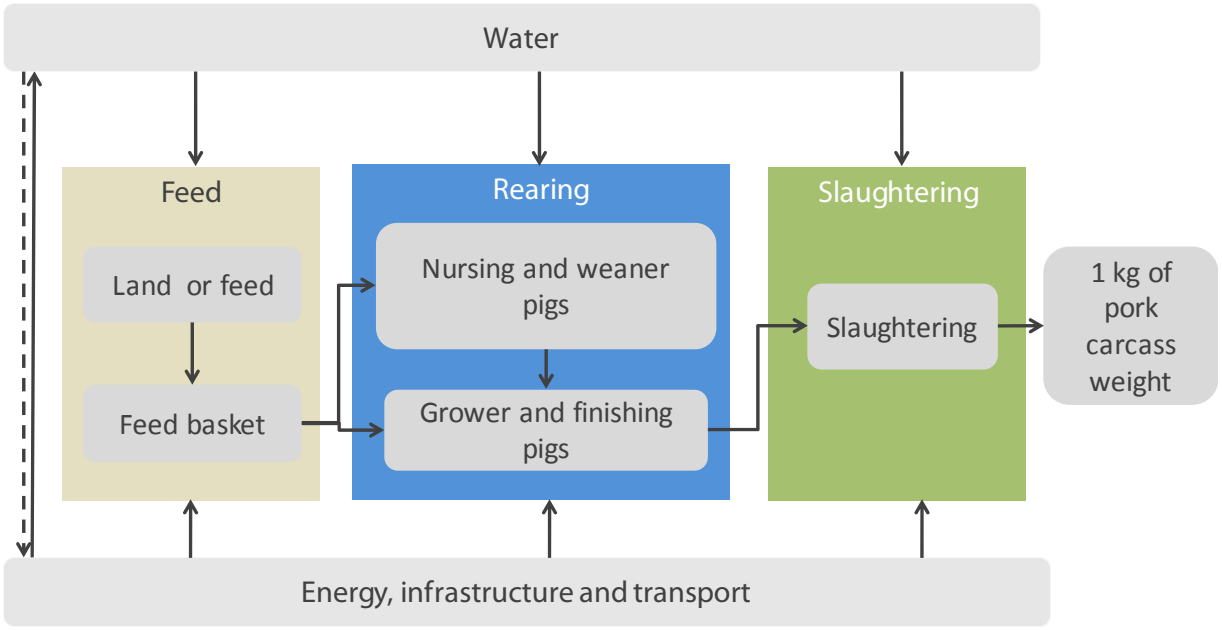

Figure 1-2 : Scope of theassessment

Two indicators were assessed:

- Climate change impacts – expressed as greenhouse gas emissions in kg CO2-eq.;
- Water consumption (L) – calculated as water withdrawn minus water reinserted in stream/ground

FUNCTIONAL UNIT

The functional unit is 1 kg of pork carcass weight (80% pork live weight).

1.3 LIFE CYCLE DATA

Life cycle data used in the study is presented in the following tables. For background data the project uses ecoinvent 3.1.

Table 1-1 : Weight, birth and mortality data

Average weight/pork - market	127.5	kg/pork
Average weight/pork - dressed	102.0	kg/pork
Mortality rate (Lactation)	12.0	%
Mortality rate (Nursery)	4.0	%
Mortality rate (Grow finish)	6.0	%
# piglet per litter	12.5	#

Source: OMAFRA 2015 and data provided by Ontario Pork

Table 1-2 : Feed recipe and intake

Growing stage	Starter	Pre-grower	Grower 1	Grower 2	Finisher 1	Finisher 2	Finisher 3	Lactation	Gestation
Pig Weight Range kg	13-25	25-30	30-45	45-68	68-91	91-110	110-130	0	0
Number of days	40	14	14	28	28	14	12	15	115
Budget kg/pig	21	9	33	60	66	64	73	15	375
Ingredient % inclusion									
Corn	38.7%	43.2%	50.3%	54.7%	54.7%	61.6%	62.7%	61.9%	51.8%
Corn DDGs	25%	25%	25%	20%	20%	15%	15%	5%	15%
Soybean Meal	30%	26.8%	21.5%	17.2%	14.3%	12.5%	9.4%	26.9%	4.5%
Wheat Shorts	0.0%	0.0%	0.0%	5.0%	8.0%	8.0%	10.0%	0.0%	25.0%
Tallow	2.6%	2.2%	0.3%	0.3%	0.3%	0.3%	0.3%	2.2%	0.3%
Micro Ingredients	3.7%	2.8%	2.9%	2.8%	2.7%	2.6%	2.6%	4.0%	3.4%

Source: data provided by OMAFRA

48% of feed is grown on farm, purchased feed is transported over 200 km (source: University of Guelph; 2012 and FAO 2013).

Energy for blending is 186 MJ/DMT of electricity and 188 MJ/DMT of natural gas (source: FAO 2013).

IPCC FORMULAS FOR ENTERIC AND MANURE EMISSIONS

IPCC formulas were used to determine enteric methane (Tier 2) and manure emissions (Tier 2).

Enteric fermentation parameters - Y_m factor of 0.39% for starter to grower 2 and Y_m of 1% for finisher and gestation.

Manure emissions - Facility repartition: 32.8% lagoon, 18.5% liquid/slurry, 4.2% storage, 4% drylot, 40.6% pit>1 month (source: Zang 2013).

Table 1-3 : GHG emissions from IPCC formulas

Emission per functional unit (FU)	
Enteric methane	7.88 g
Manure methane	48.53 g
Direct N_2O	0.217 g
Indirect N_2O (volatilization)	0.330 g
Indirect N_2O (leaching)	0.167 g

Source: FAO 2013

Manure management activities are covered by ecoinvent datasets (infrastructure and spreading)

WATER

Pigs drink 1066 liters and there are 2587 liters used per pig (service water, water wastage) (source: data provided by OMAFRA; Navia 2008; Predicala and al. 2012)

ENERGY

Pigs need 95.9 kWh of electricity and 306 MJ of natural gas (source: Navia 2008; Predicala and al. 2012)

INFRASTRUCTURE

Covered by ecoinvent dataset (Slated floor barn)

SLAUGHTERHOUSE

Dataset adapted from World Food Database
Transported over 100 km
(source: Nemecek and al. 2015)

ASSESSMENT METHODOLOGY

IPCC 100-year GHG from third assessment report
Water footprint assesses consumed water: water withdrawn and not return to watershed.

WHOLE SECTOR IMPACT

Based on 4,969,603 produced, with 102 kg of dressed mass and footprint of 4.92 kgCO2eq and 112 liters. This leads to 2,493,880 tonnes of CO_2eq emitted in 2014 and 57,116,767 m^3 of water consumed.

Equivalencies are on

- Ontario reported GHG emission of 170.8 MT of CO_2eq (source: Environment Canada, 2013)
- Ontario reported GHG emission of 22,384 kt of CO_2eq from emission from Households' greenhouse gas emissions from private vehicle operation (source: Statistics Canada, 2010)
- Ontario reported GHG emissions of 11,200 kt of CO_2eq from the National Inventory Report (source: Environment Canada, 2013)
- Niagara Falls flow rate of 2400 m^3/s (source: World WaterFall Database)

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