FAIR CAPE

PAS2050: PRODUCT CARBON FOOTPRINT SUMMARY UPDATE

4 November 2015

BOTTLED ECO-FRESH™ MILK (500ML, 1-LITRE, 2-LITRE)

This report was developed by

GCX AFRICA
making business better

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1. INTRODUCTION

Fair Cape commissioned GCX Africa to perform an updated carbon life cycle assessment ("LCA") of the Fair Cape Eco-Fresh™ Milk 500ml, 1-Litre and 2-Litre product line originally conducted in January 2012.

This summary report outlines the findings of the updated Eco-Fresh™Milk LCA, taking into account any / all changes in milk production, manufacturing and distribution processes employed during 2014/2015 period of study.

Greenhouse gas (GHG) emissions associated with its bottled Eco-Fresh™Milk were assessed in accordance with PAS2050 (BSI, Carbon Trust and DEFRA, 2008) under the business-to-business approach ("cradle to gate"). This approach sees the inclusion of emissions from inputs utilized at the earliest stages of production until point of distribution, excluding those incurred hereafter through distribution, consumer use and milk bottle disposal ("cradle to grave").

2. OBJECTIVES

Objectives for establishing a product life cycle assessment are consistent with those stated in 2012 report, namely:

- To understand the emissions embedded within the company's products;
- To be able to accurately offset the emissions associated with the specified bottles of milk with a waste-to-energy project at the Welgegund farm;
- To be in-line with the current company vision of environmental leadership

The specific objectives of this update were to:

- Ensure new feed production at Fair Cape facilities is included,
- Ensure new manufacturing processes are captured, specifically new bottle types used,
- Replace as much secondary data as possible with primary data

3. FINDINGS

A summary of the updated results are shown in tables 1 and 2, and figure 1 below:

	500 ml Bottle CO2e grams	1 Litre bottle CO2e grams	2 Litre Bottle CO2e grams
Feed Production	192	383	767
Livestock Emissions	213	425	851
Raw Material Manufacture	153	257	414
Raw Material Distribution	25	47	88
Processing	84	167	335
Distribution to DC's	14	29	58
Total	**680**	**1 308**	**2 512**

Table 1: GHG emissions in grams of CO2e, per emission source and size of bottled Full Cream Eco-Fresh™ Milk produced by Fair Cape

	500 ml	1 litre	2 litre	Tesco (per litre up to retail)
Full Cream	680	1 308	2 512	1 551
Low Fat	625	1 203	2 311	1 327
Fat Free		1 059	2 035	1 198

Table 2: GHG emissions in grams of CO2e, per Eco-Fresh™ Milk size and product fat content

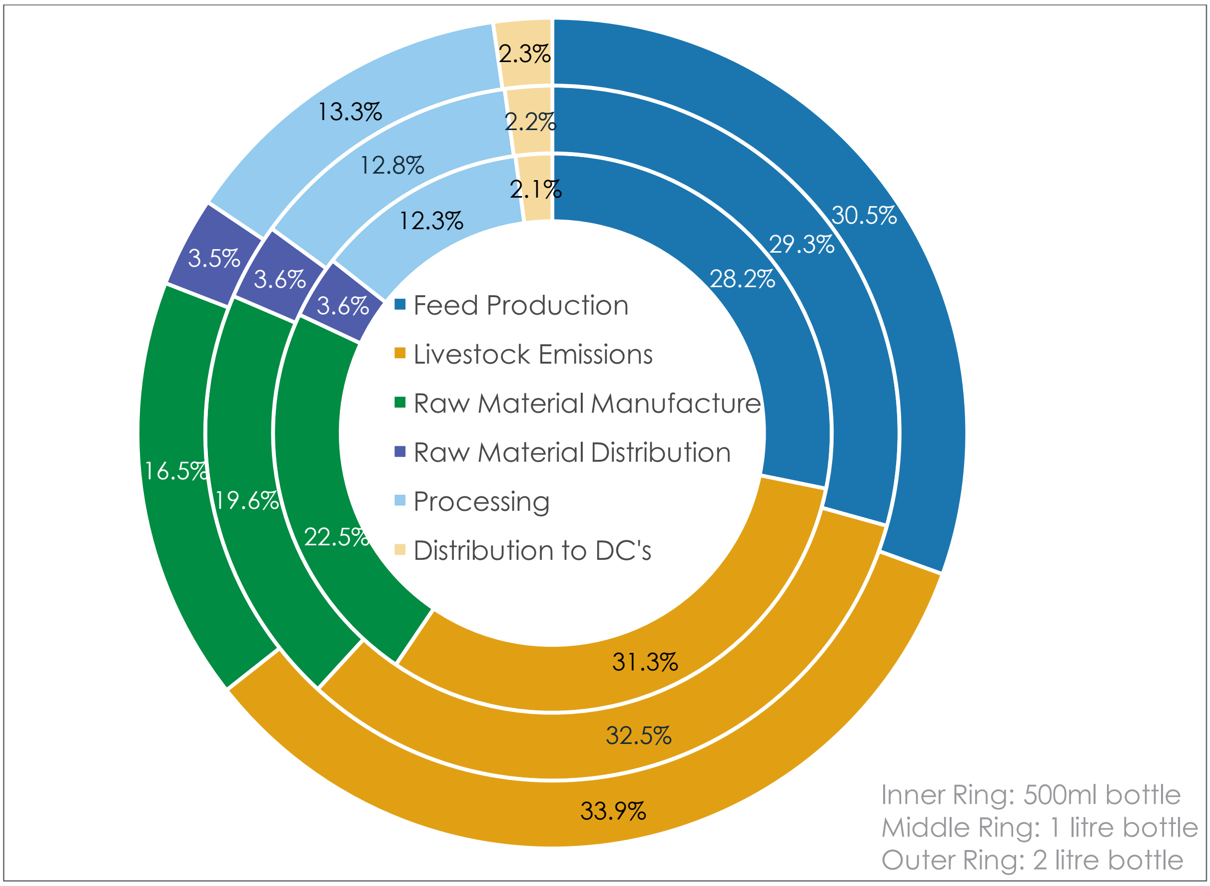

Figure 1: Comparison of emissions profile by source for the three sizes of bottled Eco-Fresh™ Milk produced by Fair Cape.

4. COMPARISON WITH 2012 ANALYSIS

Significant variances in three of the six product life cycle categories were observed, however, due to the degree and direction of changes, resulted in minimal net effects on total emissions of 0.01% (500ml bottle), -0.6% (1-Litre bottle) and -1.5% (2-litre bottle) respectively:

	500 ml			1 Litre Bottle			2 Litre Bottle		
	2012	2015	% Change	2012	2015	% Change	2012	2015	% Change
Feed Production	216	192	-11.5%	433	383	-11.5%	866	767	-11.5%
Livestock Emissions	216	213	-1.6%	432	425	-1.6%	864	851	-1.6%
Raw Material Manufacture	114	153	34.1%	193	257	33.3%	320	414	29.5%
Raw Material Distribution	39	25	-37.5%	70	47	-33.5%	125	88	-29.2%
Processing	79	84	5.3%	159	167	5.3%	318	335	5.3%
Distribution to DC's	15	14	-1.1%	29	29	-1.1%	58	58	-1.1%
Total	**680**	**680**	**0.01%**	**1316**	**1308**	**-0.6%**	**2551**	**2512**	**-1.5%**

Table 3: GHG emissions in grams of CO2e per emission source and bottle size, comparison with 2012 results.

These three significant areas of change are Feed Production, Raw Material Manufacture and Raw Material Distribution and have been detailed in the section that follows.

4.1. FEED PRODUCTION

Emissions from feed production decreased by 11.5%

Reasons for the decrease in emissions are a result of a change in

- Composition of feed mix
- Increased volumes of feed produced locally by Fair Cape (now constituting 37% of total feed consumed)
- Updated secondary emission factors used for some feed types

Total emissions for feed were calculated per feed type based on 2014/2015 data as provided by Fair Cape. Volumes per supplier and feed type are provided in table 4 below - changes in feed can be compared with 2012 LCA data in table 5 which follows:

Supplier	Type of feed purchased/produced	% of Total	Tonnes purchased p/annum
Fair Cape	Sileage + wheat Straw	37.42%	13 000
Consolidated Grain Traders	Soya	0.63%	220
	Mielies	3.43%	1 193
Mareloo	Soya	0.22%	76
	Mieliemeel	2.92%	1 016
	Katoen	0.49%	169
	Lucern	2.22%	770
SSB Transport	Applemoes	25.93%	9 007
Nova	Mielies	4.82%	1 675
	Fibremax	13.21%	4 588
	Fibremax calf	1.12%	389
	HPC Test	0.38%	131
	Calf	0.38%	131
	Silemax Dry Pellets	0.41%	143
	Silemax Dry	3.73%	1 295
Ooswes	Katoen	0.51%	176
	Lucern	0.91%	317
	Mielies	0.68%	237
Meadow	Steamup concentrate	0.60%	**209**
TOTAL			**34 739**

Table 4: Total annual feed consumption at Fair Cape per feed type and supplier for the 2015 reporting period.

	FEED CONSUMPTION PER DAY (kg/cow/day)			
	Lactating Cows	HEIFERS	DRY COWS	TOTAL:
Oat silage (Wet)	13.0	10	14	37.0
Lucerne (DRY)	4.5			4.1
Wheat Straw (W)	2.0	2	2	5.4
Maize (DRY)	9.0			8.1
Cotton Seed	1.2			1.1
Dry Apple (DRY)	2.2			2.0
Soybean Meal (DRY)	1.5			1.4
Concentrate (DRY)	3.8	4	4.5	11.1
Fuel at FC farms (at 55%)				
TOTAL	**37.2**	**16.0**	**20.5**	**70.0**

Table 5: Daily feed consumption at Fair Cape per cow type and feed type for the 2012 reporting period.

The same methodology and emission factors utilized in the 2012 assessment were applied for Fair Cape grown oat silage and wheat straw. 15% of production was allocated to wheat straw and 85% to oat silage as per the 2012 division. Aslo, as per 2012, only 5% of wheat production emissions were allocated to wheat straw.

While emission factors for Lucerne, dry apple and concentrate remained consistent, the current methodology used mean values for such, whereas the 2015 study used the upper range of emission factors. The mean values were considered to be more closely aligned with the findings of the Greenhouse Peer Review report of 2012 which highlighted the conservative nature of previous upper values used.

Updated emission factors were used where more relevant and comprehensive secondary data sources had subsequently become available. These included: The Seventh Framework Programme: Theme 2: Food, Agriculture and Fisheries, qnd Biotechnologies, Deliverable 10.2: Compiled database on LCA (Life Cycle Assessment) coefficients for including pre-chain emissions in LCA of animal products.

These emission factor changes are indicated in table 6 below.

An additional 5% of total emissions calculated from feed were included in order to ensure conservative values.

	Conservative LCA based emission factors used in 2012 study (kg CO2e /tonne)	LCA based emission factors used in 2015 study (kg CO2e/tonne)
Oat silage (Wet) - based on Primary data from Fair Cape production	198	198
Lucerne (DRY)	400	300 (using mean from 2012 study)
Wheat Straw (W) - based on Primary data from Fair Cape production but allocate 5% only.	752	752
Maize (DRY)	350	274
Cotton Seed	450	325
Dry Apple (DRY)	350	235 (using mean from 2012 study)
Soybean Meal (DRY)	585	106
Concentrate (DRY)	700	417.5 (using mean from 2012 study)

Table 6: LCA based emission factors used for feed production for the 2012 study and the 2015 update.

4.2. RAW MATERIAL MANUFACTURE

Emissions from Raw Material Manufacture increased by 34.1% (500ml) 33.3% (1L) and 29.5% (2L)

The increases in emissions are attributed to both the change in materials used in the manufacture of the new milk bottles and updated data from the manufacturers for the preform bottles. Energy (electricity) production per unit was almost four times higher in this reporting period than that reported in 2012.

4.3. RAW MATERIAL DISTRIBUTION

Emissions from Raw Material Distribution decreased by 37.5% (500ml) 33.5% (1L) and 29.2% (2L)

Changes in emissions pertaining to the distribution of plastic raw materials are largely attributed to shorter distances travelled in the transport of raw materials from Cape Town Harbor by suppliers SFX and VINMAR. This is distance is assumed at 20km compared to the 1600km reported in the 2012 when materials were transported from supplier HOSAF to Polyoak.

5. METHODOLOGY

GCX Africa used the same methodology that was utilized in the 2012 assessment, incorporating more up to date and secondary emission factors where possible. The methododoly is outlined below:

This report followed the 4 basic steps as laid down in PAS2050:

- Build a Process Map
- Check Boundaries and Prioritisation
- Data Collection
- Footprint Calculation

The process map and boundaries conformed with the Product Category Rules (PCR) for the assessment of the life-cycle environmental performance of "Processed liquid milk" as well as for the declaration of such performance by an Environmental Product Declaration (UN CPC 2211).

In accordance with PAS2050:

- The Cradle to Gate approach was used inclusive of all emissions associated up to the point of the bottle arriving at the Fair Cape Distribution Centres. This excludes emissions associated with external distribution to retailers, retail, consumer use and disposal of the milk bottles.
- Primary data was used for all Fair Cape-owned activity wherever possible.
- Primary data was used for all areas in the value chain where data was readily available, and emissions from such sources were material.

- CH_4 and N_2O emissions associated with livestock were calculated using a Tier 2 methodology as set out in the IPCC Guidelines for National Greenhouse Gas Inventories (Volume 4, Chapter 10, 2006).
- The proportion of farm and feed emissions were allocated at 96% towards the dairy cows, with the remaining emission associated with cows to slaughter, as advised by Fair Cape personnel.
- Feed production emissions for Fair Cape controlled feed growing process (oat and wheat) were calculated using the Cool Farm Tool V1.1, developed by the University of Aberdeen and commissioned by Unilever Plc.
- Emissions associated with water and wastewater (containing low concentrations of milk from losses) were excluded.
- All transportation emissions included the return trips.
- Land use change emissions were omitted from all Fair Cape owned farms, as these have been operational or over 20 years.
- Secondary data was used in areas where primary data was not readily available, and where such emissions represented less than 10% of total emissions of the product.
- Secondary data was consulted for feed emission calculations where these emissions did represent more than 10% of the product emissions.
- Some of the secondary data, from foreign studies used to determine data averages for feed production not occurring on Fair Cape owned farms, do include land use change emissions. These additional emission inclusions err on the conservative side, and may result in an overestimation of feed-based emissions.
- Secondary emission factors used were from DEFRA (2015) or IPCC (2007), unless stated otherwise.
- All secondary emission factors used were LCA based emission factors (based on UK LCA inventories).
- Milk losses (at production) were accounted for.
- All emissions were expressed as CO_2 equivalents (CO_2e), and accounted for carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O).
- Global Warming Potentials (GWPs) used for calculating fugitive emissions from refrigerant gases were from DEFRA (2015).
- The GWP for methane from cows (from enteric fermentation and manure management systems) was taken at a conservative value of 25. Reduction for biogenic proportion of methane from primary sequestration was not accounted for. This conservative approach may account for an overestimation of emissions from these sources.
- An electricity grid emission factor for South Africa of 1.03kg CO_2e/kWh was applied (Eskom, 2014).
- Allocation of emissions between Full Cream, Low Fat and Fat Free milk was based on economic value of cream.
- All activity data in the report was submitted to GCX by Fair Cape and by Fair Cape's respective suppliers.
- Detailed calculations, assumptions and limitations are as per main 2012 report detailed in Appendix B of that report.

6. LIMITATIONS

- Although Fair Cape has attempted to gain primary data for the feed components not owned by Fair Cape from the various feed suppliers, such data was not accessible over the period of conducting the study. Secondary data sources on emissions associated with feed production were however updated using more relevant secondary data source:
- Secondary data sources for feed production was sourced from The Seventh Framework Programme: Theme 2: Food, Agriculture and Fisheries, qnd Biotechnologies, Deliverable 10.2: Compiled database on LCA (Life Cycle Assessment) coefficients for including pre-chain emissions in LCA of animal products.
- LCA based emission factors were used for all sources except for SA grid emission factors resulting from electricity consumption. Reliable sources for LCA base emission factors were not available for this study.

7. CONCLUSION

Fair Cape has successfully measured the embedded emissions associated with its Eco-Fresh™ bottled milk products using the PAS2050 business-to-business model.

The "GCX Assessed" logo is available for use in the labelling of Fair Cape's milk bottles.

This logo should be accompanied by an explanatory note detailing:

- The amount of emissions (dependent on the bottle size);
- The methodology used (PAS2050); and
- The boundary applied (i.e. business-to-business).

Figure 2:"Assessed" Logo – Global Carbon Exchange