

500 food LCA database



salling fondene

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Online 13-16th October 2020

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500 food LCA project

- Commissioned by Salling Fondene
- Largest retail chain in Denmark
- Carried out by
- Timeline

salling fondene

salling group



- Data sets
- Reporting
- Transparent database

November 2020

December 2020

December 2020

The project

670
Products

4200
Datasets

- 500 food, at super market
- 155 crops, at farm
- 10 animal products, at farm

43+5 countries
Global

Who

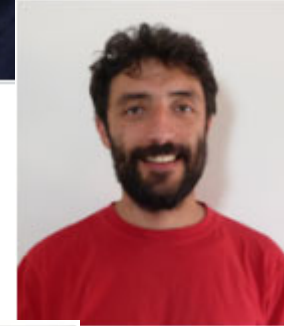
Ivan Muñoz, PhD

- Data collection: production data for food processing



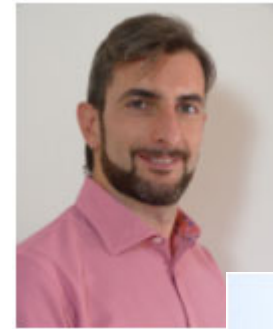
Stefano Merciai, PhD

- Modelling agriculture
- Programming the database



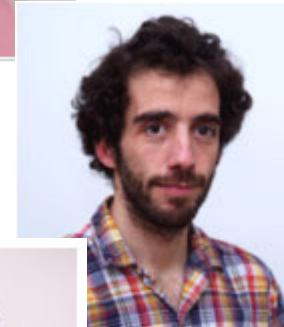
Michele De Rosa, PhD

- Data collection: Fertilisers, fisheries, database management



Miguel Astudillo, PhD

- Programming metadata and managing documentation for >4000 data sets



Jannick Schmidt, PhD

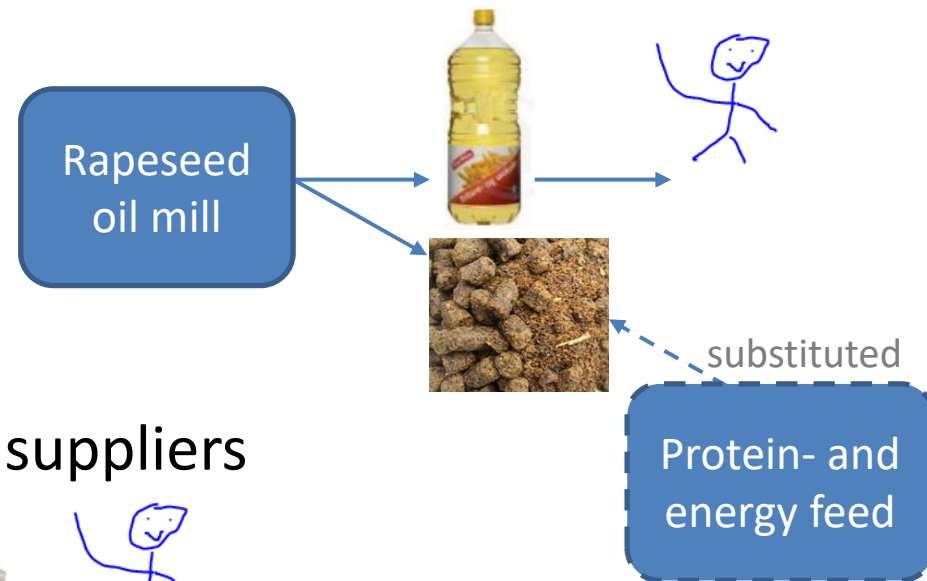
- Teamleader
- Responsible for methods and modelling
- Reporting



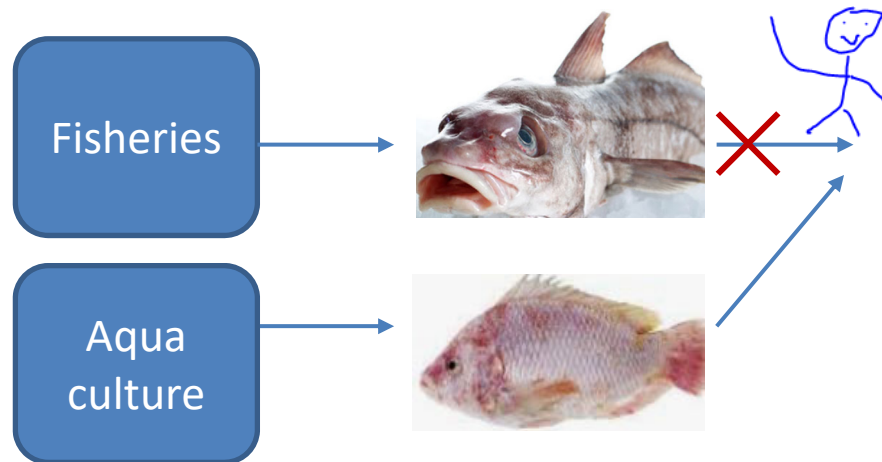
Metode

- Standard for life cycle assessment (LCA):
ISO 14040 og 14044

- By-products: Substitution**



- Marked mix: Only flexible suppliers**



LCI of agriculture

■ Combining

- FAOSTAT (all crops and animals)
- Fertiliser data (IFA)
- Fertiliser recommendations
- Crop property data (protein, dm% etc.)
- Soil data
- Emission factors (IPCC)
- Coefficient data
- Gap filing: EXIOBASE

■ Creating

- Transparent emission inventories
- N-balances for crops and animals

155 crops in 43+5 countries/regions

field	unit	DK.Strawber ries	DK.Sugar beet	DK.Tomatoe s	DK.Triticale	DK.Vegetabl es, fresh nes	DK.Wheat	EE.Ap
Reference flow	kg	6,727	71,009	307,413	5,564	19,492	7,207	
Land	ha	1	1	1	1	1	1	
Period	year	2016	2016	2016	2016	2016	2016	
DM coefficient	%	8	22	6	85	4	85	
Protein content (DM)	%	8.4	11.4	14.7	10.5	22.5	11.5	
Phosphorous content (DM)	%		0.16	0.48	0.30		0.37	
Input - N-fertilisers	kg	82	97	136	119	136	146	
Input - P2O5-fertilisers	kg	132	141	161	88	161	69	
Input - K2O-fertilisers	kg	120	291	416	77	416	167	
Output - Total residues	kg	6,794	35,505	310,487	5,954	9,843	7,711	
Total Harvested Area	ha	1,170	33,100	34	10,100	1,180	583,000	
Air - Dinitrogen monoxide	kg	2	3	4	3	4	4	
Air - Methane, biogenic	kg							
Air - Nitrogen oxides	kg	0	0	1	1	1	1	
Air - Ammonia	kg	8	10	14	12	14	15	
Water - Nitrogen, total	kg	110	135	181	159	181	194	
Water - Phosphorus, total	kg	2	2	1	1	2	1	
Soil - Phosphorus, total	kg	56	50	35	26	68	18	

10 animal systems in 43 + 5 countries/regions

order	Item	unit	BR.Cattle - Meat	BR.Cattle - Milk	BR.Goats - Milk	BR.Pig meat	BR.Poultry - Eggs	BR.Poultry - Meat
1	Output - Live animal	tonnes	2,782,622	2,570,085	47,893	2,385,794	2,306	8,552,2
2	Output - Milk	tonnes	0	4,041,648	30,719	0	0	
3	Output - Methane	tonnes	4,594,757	4,454,965	34,025	60,080	0	
4	Output - Manure	tonnes	86,950,657	82,499,934	747,013	6,852,687	3,437	24,548,3
5	Output - CO2	tonnes	197,119,950	180,514,903	2,070,319	16,464,106	2,412	33,489,3
6	Output - H2O	tonnes	69,288,620	63,451,865	443,250	4,767,406	516	7,169,9
7	Input - Total feed	tonnes	217,376,642	206,249,834	1,867,533	18,556,178	6,917	49,404,0
8	Input - of which: Crop residues	tonnes	61,240,027	58,136,427	526,409	5,230,501	1,950	13,925,6
9	Input - of which: Forages and Grass	tonnes	131,263,388	124,518,311	1,127,478	3,491,350	0	
10	Input - of which: Market feed	tonnes	24,873,227	23,595,096	213,647	9,834,328	4,967	35,478,3
11	Input - Oxygen	tonnes	143,359,963	131,283,566	1,505,687	11,973,895	1,754	24,355,9
12	Total outputs	tonnes	360,736,605	337,533,400	3,373,220	30,530,074	8,672	73,759,9
13	Total inputs	tonnes	360,736,605	337,533,400	3,373,220	30,530,074	8,672	73,759,9
14	Balance = Inputs - Outputs	tonnes	0	0	0	0	0	

500 food processing

		dm (kg dm/kg wm)	Pizza, salami
Sources:			Open Food Facts (2020) Dr. Oetker
Comments:			Cheese, tomato and salami content f
Storage			Cooled
Exchanges:			
Reference flow	kg		1.00
	L		
Dry mass (kg dm/kg wm)			64%
Raw materials			
Tomato paste	kg	27%	0.31
Cheese	kg	50%	0.15
Salami	kg	71%	0.12
Water, tap	L	0%	0.11
Wheat flour	kg	87%	0.11
Yeast	kg	95%	0.10
Salt	kg	100%	0.06
Olive oil	kg	100%	0.05
Energy			
Electricity	kWh		2.57
Natural gas	MJ		7.51
By-products and organic waste			
Organic waste, wet weight	kg	0.5	0.03
Wastewater	L	0	0.02

Background database

- **Free download:** exiobase.eu
- **Granularity:** 200 products x 164 activities
- **Geography:** 43 countries + 5 RoW regions
- **Time:** 2011 **Update 2016:** <https://lca-net.com/clubs/exiobase-update/>
- **iLUC model integrated**
- **Extensions**
 - Waste: 17 homogenous fractions
 - Emissions: 62
 - Resources: 37
 - Land use
- **Unit of product flows:**
 - EUR, kg, MJ



Conclusions

Characteristics

- Fully flexible: Parameterised, background database modeling assumptions, updates

Deliverables

- Standardised datasets with results (next slide)
- Report that describes methods
- Database for LCA software

What is next?

- Currently 500 foods are placed in DK corner of the model
- Next:
 - 500 foods in all countries
 - More foods

Example of standardised result data sheet

ID	1648
Group	Pizza
Name	Pizza, salami
Total GHG (CO₂-eq)	3.78 kg CO₂-eq/kg
Primary production	2.10 kg CO ₂ -eq/kg
iLUC	0.90 kg CO ₂ -eq/kg
Processing	0.20 kg CO ₂ -eq/kg
Packaging	0.12 kg CO ₂ -eq/kg
Transport	0.11 kg CO ₂ -eq/kg
Retail (cooling, freezing)	0.35 kg CO ₂ -eq/kg
Energy (kj)	1308 g pr. 100 g
Fat	14.5 g pr. 100 g
Carbohydrates	31.7 g pr. 100 g
Protein	12.8 g pr. 100 g

	A	B	C	D
	Link			
		dm		Pizza, salami
		(kg dm/kg		
		wm)		
1				
2	Sources:	Open Food Facts (2020) Dr. Oetker		
3	Comments:	Cheese, tomato and salami content f		
4	Storage	Cooled		
5	Exchanges:			
6	Reference flow	kg		1.00
7		L		
8	Dry mass (kg dm/kg wm)			64%
9	Raw materials			
10	Tomato paste	kg	27%	0.31
11	Cheese	kg	50%	0.15
12	Salami	kg	71%	0.12
13	Water, tap	L	0%	0.11
14	Wheat flour	kg	87%	0.11
15	Yeast	kg	95%	0.10
16	Salt	kg	100%	0.06
17	Olive oil	kg	100%	0.05
18	Energy			
19	Electricity	kWh		2.57
20	Natural gas	MJ		7.51
21	By-products and organic waste			
22	Organic waste, wet weight	kg	0.5	0.03
23	Wastewater	L	0	0.02

A photograph of a grocery store aisle. In the foreground, a metal shopping cart is filled with fresh produce, including green leafy vegetables, a bunch of green herbs, and a red bell pepper. Behind the cart, several green plastic crates are filled with ripe, red and yellow apples. The background is slightly blurred, showing more of the store's interior and a person in the distance.

Thank you



LCA consultants

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