



Algemene gegevens	
TKI-Nummer	BO-31.03-007-001
Titel	ENREMILK
Topsector (A&F of T&U)	A&F
Projectleider (onderzoek)	Volkert Beekman
Werkelijke startdatum	01-01-2014
Werkelijke einddatum	31-12-2017
Korte omschrijving inhoud (max. 4 regels)	DLO ontwikkelt een procesmodel waarmee het water- en energieverbruik in de melkpoeder- en mozzarellaproductie kan worden gemonitord onder huidige omstandigheden, dan wel met gebruik van innovatieve technologieën

uitvoerende partijen	
Betrokken kennisinstellingen	Land
Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.v	Duitsland
Universität Hohenheim	Duitsland
National Institute of Agricultural Economics	Italië
Universitat Politècnica de Catalunya	Spanje
Escuela Superior de Administracion y Direccion de Empresas	Spanje

Overige partijen	Land
C. Van 'T Riet Dairy Technology	Nederland
DanTech UK Ltd (DanTech)	Verenigd Koninkrijk
Eilenburger Elektrolyse- & Umwelttechnik GmbH	Duitsland
Ragusa Latte Società Cooperativa	Italië
ASIO Spol. S.R.O.	Tsjechië
HELIX GmbH	Duitsland
Joachim Lippold Energie und Ökologie Consultants	Duitsland
Schwarzwaldmilch GmbH Freiburg	Duitsland
Heckmann Maschinenbau Und Verfahrenstechnik GmbH	Duitsland

Resultaten en deliverables	
<p>1. Welke deliverables zijn opgeleverd, en is dit conform het projectplan? (geef een korte beschrijving per deliverable uit het projectplan)</p>	<p>Het project heeft twee hoofdtaken: WP2 Monitoring van water en energieverbruik en het ontwerp en doorrekenen van energie- en waterbesparende scenarios op basis van een procesmodel.</p> <p>D 2.1 Report on case study baseline databases D 2.2 Report on process models with assessed water and energy saving potentials and economic consequences This deliverable describes the development and application of a process model to measure energy and water consumption in the production process of skimmed milk powder (SMP) and mozzarella. The objective of doing so is to identify hotspots in energy and water use, which indicate potential for energy and water savings.</p>

	<p>D 2.3 Report on delineated scenarios of technology introductions for further assessment and testing</p> <p>This deliverable describes the application of a process model to measure energy and water consumption in the production process of skimmed milk powder (SMP) and mozzarella under different technology scenarios. The objective of doing so is to identify potential energy and water savings that can be achieved by introducing innovative technologies. For the SMP case, five alternative scenarios were defined, while the mozzarella case comprised three alternatives</p> <p>- WP11: Studie naar de milieu-effecten (Planet dimensie van duurzaamheid) van invoer van nieuwe technologieën op basis van levenscyclus analyse.</p> <p>D. Environmental impact assessment report with an analysis of water and energy use and a selection of impact categories</p> <p>WP 11.</p> <p>This work package assesses the environmental sustainability of the EnReMilk's engineering solutions for saving water and energy in dairy processing using a life cycle approach.</p> <p>Aim:</p> <ul style="list-style-type: none"> - To verify the cradle-to-cradle (C2C) environmental sustainability of EnReMilk using a recognised LCA approach based on ISO14040/44 (2006). - To quantify the environmental sustainability impact in categories, such as land use, use of non-renewable energy, climate change, acidification and eutrophication <p>D. 11. 1 Environmental impact assessment report with an analysis of water and energy use and a selection of impact Categories</p> <p>This report maps and assesses the potential changes in environmental sustainability as a result of innovations in dairy processing. The goal of this LCA is to identify the environmental hotspots producing skimmed milk powder, quark powder and mozzarella in three distinct case studies, and to compare the environmental aspects of different innovations in these production processes.</p>
<p>2. Indien bepaalde deliverables niet gehaald zijn, wat was daarvoor de reden?</p>	<p>All deliverables are met.</p>
<p>3. Heeft het project onverwachte (neven)uitkomsten opgeleverd, die vooraf niet waren voorzien? Zo ja, benoem deze.</p>	<p>No.</p>
<p>4. Op welke wijze is over het project en de resultaten gecommuniceerd</p>	<p>Communication is done through events https://www.enremilk.eu/news-events.html and by our dedicated website https://www.enremilk.eu/media-centre.html</p> <p>The project objectives and results are also bundled in our 10 minutes video, disseminated through YouTube. See https://www.youtube.com/watch?v=s4Aur1vPero</p>

	<p>All methodological choices have been coordinated with developments in the field, in which the PEF Dairy Pilot and the release of the IDF standard on GHG reporting are important contributions.</p> <p>From past (second) reporting period: The allocation approach was revised, and the findings of the study and the comparison were presented on the LCA Food 2016 conference in Dublin (Link to conference abstract)</p> <p>WR KennisOnline http://www.wur.nl/nl/project/Enremilk-Integrated-engineering-approach-AF-EU-14014.htm</p>
<p>5. In hoeverre heeft het project bijgedragen aan de ontwikkeling van de betrokken kennisinstelling(en)? (bijv. wetenschappelijk track record, nieuwe technologie, nieuwe samenwerkingen)</p>	<p>The WECR team has developed experience on process modelling and LCA. The outcomes has been presented during several occasion (see list of dissemination activities) The co-operation with Fraunhofer institute (co-ordinator) and the consortium members was good.</p>
<p>6. Krijgt het project een vervolg in de vorm van een nieuw project of een nieuwe samenwerking? Zo ja, geef een toelichting.</p>	<p>At this moment we do not have a current lead. However the team planed an evaluation and a meeting to discuss potential developments and acquisition.</p>

<p>Highlights:</p> <p><u>General information</u></p> <p>WP11 consists of an Life Cycle Assessment (LCA), which will provide detailed insight in the environmental hotspots producing milk powder, quark powder and mozzarella, and it will compare the environmental aspects of different innovations in the production of these product. It will, in a quantitative way, broaden the view on the sustainability effects of the innovations tested in the EnReMilk project from Energy and Water consumption alone to a broader selection of environmental impacts.</p> <p><u>Task 11.1 Goal and scope</u></p> <p>Progress of work: Between December 2016 through the third reporting period until January 2018, most of the goal and scope have remained the same after incidental checks with the key project partners. The scope was expanded from two cases to three cases to include quark powder production. Since numerous similarities exist between quark powder and skimmed milk powder, this was a small change in scope. Waste water treatment and processing equipment were also included in scope. The changes were implemented in the LCI model of task 11.2.</p> <p>Expected results: It was expected that little was changed to the goal and scope. The goal and scope were defined in such a way to maximize the value of the results.</p> <p>Clearly significant results:</p> <ul style="list-style-type: none"> - All methodological choices have been coordinated with developments in the field, in which the PEF Dairy Pilot and the release of the IDF standard on GHG reporting are important contributions. - From past (second) reporting period: The allocation approach was revised, and the findings of the study and the comparison were presented on the LCA Food 2016 conference in Dublin (Link to conference abstract) <p><u>Task 11.2 Life cycle inventory</u></p> <p>Progress of work: All primary data demands were filled through the WP2 Process Model which was continuously improved throughout the reporting period, giving rise to several iterations in the LCI model.</p> <ul style="list-style-type: none"> - The final version of the primary data for all scenarios (baseline and innovations) were collected by the end of November 2017 with reasonable reliability.

- The output format for the data from the WP2 Process model was used for regular exchange of data.
- An excel based model was developed to translate the WP2 Process model data in the LCI in a flexible and repeatable manner.
- The latest version of EcoInvent, 3.3, was used, as planned, in order to translate all resource consumptions into LCI items.

Expected results: Final version of LCIs for all scenarios was created from collected data.

Clearly significant results: The excel based model was built to accommodate the many iterations in the WP2 Process Model, and turned out to be more flexible than SimaPro software.

Task 11.3 Life cycle impact assessment

Progress of work: LCIA-characterized results for all resources used by the dairy facilities were exported from SimaPro to the Excel model. These were connected with all resource usages in the Excel model, so that hotspots identification, improvement assessment and sensitivity analysis could be conducted. As planned the LCIA characterization method ReCiPe 2016 was released early 2017 and used for LCIA.

Expected results: Based on the conducted activities, the report could be written and conclusions could be drawn.

Clearly significant results: The excel model enabled very flexible way of presenting impact characterization results through a very detailed categorization of resource contributions.

Task 11.4 Interpretation

Progress of work: Data quality management was executed and the main result was intensive interaction with the researchers employing the WP2 process model to optimize data quality, understand variability and uncertainties. Sensitivity analyses were easily conducted since the excel model was fully parameterized in task 11.2. Uncertainty analysis was elaborated qualitatively.

Expected results: The interpretation phase enabled a proper discussion of the results and well-founded conclusions and recommendations.

Clearly significant results: Interpretation went as planned and was conducted efficiently.

Deviations from Annex I DoW and potential impact on other tasks, resources and planning:

No deviations.

Use of resources :

According to Annex I we have scheduled 6.98 man months of personnel resources for WP11. Use of man months is according to project plan.

Knelpunten: geef een korte beschrijving van de eventuele inhoudelijke knelpunten

None.

Aantal opgeleverde producten					
Wetenschappelijke artikelen	Rapporten	Artikelen in vakbladen	Inleidingen/ workshops/ invited lectures	Aangevraagde octrooien /first filings	Spin-offs (*)
			1. Presentation Roel Helmes Webinar for The Sustainability		

			Consortium: Be smart with allocation in technology evaluation in dairy processing (2016) 2.Conferences Roel Helmes: Dublin. Allocation choices strongly affect technology evaluation in dairy processing (2016) 3.Workshop: Volkert Beekman: Workshop Open day at S-Milch "Stakeholder environmental impact assessment" at Open day at S-milch		
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(*) Hiermee wordt bedoeld: contractonderzoek dat voortkomt uit dit project, aanvullende subsidies die zijn verkregen en spin-off bedrijvigheid.

Verwacht u nog een octrooiaanvraag naar aanleiding van dit project?	NEE
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Bijlage: Titels van de producten of een link naar de producten op een openbare website

Robbemonnd, R.,M., C.H.G. Daatselaar, and M.L.H. Breukers (2015). **Modelling and evaluating water- and energy-saving potential of processing technologies in the dairy industry**. 9th International European Forum (IglS-Forum) (144th EAAE Seminar) on System Dynamics and Innovation in Food Networks, February 09-13, 2015 - Innsbruck-Igls, Austria.

Roel Helmes^{1*}, Tommie Ponsioen¹, Robbert Robbemonnd¹ - **Allocation choices strongly affect technology evaluation in dairy processing, 2016 Dublin**