



**PPP annual report 2018**

PPPs which have started under the direction of the top-sectors need to deliver an annual report regarding their research and financial progress. For reporting on research progress this format has to be applied. A separate format 'PPP final report' is available for PPPs that have finalized in 2018.

**Annual reports are entirely published on the TKI/topsector website(s). Please prevent the incorporation of confidential matter in the report.**

PPP annual reports have to be submitted - pooled for each research organisation - before 1 March 2019 to the TKIs at [info@tkitu.nl](mailto:info@tkitu.nl), or at [info@tki-agrifood.nl](mailto:info@tki-agrifood.nl). For Wageningen Research the delivery of reports occurs centrally.

<b>General data</b>	
PPP number	<b>AF-15503</b>
Title	<b>Evolutionary Trade-offs in dairy fermentation</b>
Theme	<b>Gezond&amp;Veilig</b>
Executing research organisation(s)	<b>WUR, VU Amsterdam, NIZO</b>
Project leader research (name + email address)	<b>Herwig Bachmann; herwig.bachmann@nizo.com</b>
Coordinator (on behalf of private parties)	
Contact person of government	<b>onbekend</b>
Total project budget (k€)	<b>1818 kEuro</b>
Project website address	<b><a href="https://www.tifn.nl/project/evolutionary-trade-offs-in-dairy-fermentations/">https://www.tifn.nl/project/evolutionary-trade-offs-in-dairy-fermentations/</a></b>
Starting date	<b>1 oct 2016</b>
Final date	<b>Dec 2021</b>

**Approval coordinator/consortium**

The annual report has to be discussed with the coordinator/consortium. The TKI(s) like to be informed regarding potential comments on the annual report.

The annual report is ..... by the coordinator on behalf of the consortium	<input type="checkbox"/> approved <input type="checkbox"/> not approved
Potential comments regarding the final report	

**Brief description content/aim PPP**

What is the matter and what does the project contribute?  
What does the project deliver and what are the effects of its delivery?

In engineering and economics trade-offs are well known. Similarly, evolutionary trade-offs in microbial cells are defined as the optimization of one trait at the cost of another. For instance if a cells puts lots of energy into the production of costly molecules like exo-polysaccharides little energy is available for cell growth.

This project focuses on the influence of trade-offs on industrial fermentations. We will investigate the role for key enzymes in dairy fermentations including enzymes involved in growth, (post-) acidification, flavor- and texture formation. Industrially relevant parameters will be investigated including temperature, salt, starvation and pH stress. These conditions change rapidly throughout cheese manufacturing and we will investigate how these changes influence functionality of the starter culture in the fermented dairy product. The results of this project are designed to allow us to develop new starter cultures, shorten lag-phases, increase flavor formation and shorten cheese ripening times and improve the robustness of the fermentation process.

**Results 2018**

Give a brief description of the high-lights in 2018.

While the first year of the project was dominated by the development of methodology we started to use them and approach relevant biological questions in 2018. For this we cultured lactic acid bacteria in bioreactors at different growth rates and performed RNA and proteome analysis we measured enzyme stability and decay over prolonged incubation periods, determined growth laws in relation to environmental transitions and applied a modelling framework that is able to integrate the data described above and which made predictions on cellular constraints that may determine trade-offs. We are still in the process of producing more experimental data to answer open questions on microbial trade-offs in dairy fermentation and how this might be used to steer fermentation processes. We anticipate that the data will allow to improve the production process and functionality of starter cultures and give more control over the starter culture and cheese manufacturing as well as cheese ripening.

**Number of delivered products in 2018** (give titles and/or description of products, or a link to the products on the project website, or other public websites).

Scientific articles	Reports	Articles professional in journals	Lectures/workshops

**Titles/descriptions of prominent products in 2018 (max. 5) and their targets groups**