



General information	
PPP number	TKI-AF-15235
Title	PPS Tasty Sustainable Frozen Foods
Roadmap/Umbrella	Topsector Agri & Food, Roadmap High quality products and processing, Theme Healthy and Safe
Executive knowledge institution(s)	Wageningen Food & Biobased Research
Research project leader (name + e-mail address)	Ariette Matser Ariette.matser@wur.nl
Coordinator (on behalf of private parties)	Bjorn van den Oudenhoven, LambWeston / Meijer
Government contact person	Cor Wever
Start date	1 January 2016
End date	31 December 2019

Approval coordinator/consortium	
The coordinator has assessed the annual report on behalf of the consortium:	<input checked="" type="checkbox"/> approved <input type="checkbox"/> rejected
Possible feedback on the annual report:	

Short content description/aim PPS
The objective of the project is to understand the physical causes of the loss of product quality of frozen foods, with the aim to improve their quality at the point of consumption and to reduce energy consumption during storage and processing of frozen products.

Planning and progress	
Is the PPP going according to plan? ¹	Yes
Have there been changes in the consortium/project partners?	No
Is there a delay and/or deferred delivery date?	No
Are there any substantive bottlenecks? Provide a brief description	No
Are there any deviations from the projected budget?	No
Do you expect a patent application to arise from this PPP?	Not at this moment

Current summary of the project for the website Kennisonline
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¹ If applicable, use the explanation from the financial project report

Freezing is a frequently used method to extend shelf life, to avoid spoilage of food, and loss of value in the chain. It contributes greatly to the reduction of food waste. Energy consumption, quality, weight and aggregation during frozen storage have led to a worse image than food directly prepared from fresh products. The objective of the project is to improve the final quality of frozen products after processing by consumers and reduce energy consumption during storage and processing of frozen products.

To freeze and realize improvements in frozen storage, it is essential to understand both the performance of the process and the changes in the product. To understand the physical causes of loss in product quality of frozen products, in this project companies and knowledge institute work towards the scientific understanding of moisture migration and crystal formation, understanding of impact of variations in storage conditions and create the bridge to apply this knowledge in practice.

This insight will help businesses to deliver better quality frozen products as finished and semi-finished product. The industrial partners of the consortium will be the first to apply these insights to show the added value. By neutralizing the negative aspects of frozen food, the opportunity arises to emphasize the positive aspects of frozen foods, such as better retention of nutrients such as vitamins and short preparation time (after thawing). More use of frozen products, increases the food industry flexibility in sourcing and prevents spoilage. Improved freezing and storage processes provide for reduction of energy consumption in this sector.

Highlights:

Highlights of the activities of 2017:

Frosting and clumping in frozen fruits and vegetables

During storage of frozen fruits and vegetables, frosting (formation of a small layer of ice crystals) occurs on the surface of the products and individual products can connect to each other in the formation of large blocks of frozen products (clumping). These processes negatively affect the quality of the products and the use of the product. Based on scientific literature and knowledge of the partners, an overview was made of the possible influence of surface properties, role of oil blends, process conditions and storage conditions on this. The hypotheses resulting from this are used as guidance of the experiments that are performed in the project. A scientific review is written and submitted for publication.

Role of oil properties in quality of frozen par-fried potatoes

In addition to the processes for frozen fruits and vegetables, the properties of frozen par-fried potatoes are also influenced by the oil blends used and the conditions of the frying process prior to freezing. A method was developed to characterize the composition of oil blends as a function of temperature and time. Industrial relevant temperature – time conditions for freezing and storage were used to determine the amount of crystallised fat in different oil blends.

Relation between temperature conditions and product quality

Detailed measurements were done at an industrial freezing line to determine temperature profiles of individual products in different stages of the production process. These temperature profiles are currently used in the developed lab scale pilot system for pretreatment and freezing of vegetables to determine the impact on quality after freezing and during frozen storage. With the lab scale system, extreme conditions can be evaluated to research the hypotheses on effect of processing conditions on product quality. By performing research both on industrial scale and lab scale, the project makes sure that relevant conditions are researched and results can be applied on industrial scale.

2 February 2018, a public workshop will be organised to present project results to a wider public.

Number of delivered products in 2017			
Academic articles	Reports	Articles in journals	Introductions/workshops
1	0	0	1

Appendix: Names of the products

Scientific publications

	Title	Year
1	R.G.M. van der Sman. Clumping of frozen par-fried foods: Lessons from frosting on structured surfaces. Submitted for publication	2017

Other dissemination activities

	Title	Year
1	R.G.M. van der Sman. A deep drive into the deep freeze. New Food, Vol. 19, issue 2, 2016, p.13-15	2016
2	R.G.M. van der Sman. Phase field simulation of directional freezing of sugar solutions. Presentation at DSFD2017, 26 th International conference on discrete simulation of fluid dynamics. 10-14 July 2017. Erlangen, Germany	2017

Link naar websites:

<http://topsectoragrifood.nl/project/duurzaam-ingevroren-en-smaakvol/>

<https://www.wur.nl/nl/project/AF-15235-Duurzaam-ingevroren-smaakvol-1.htm>

Akkoord Hans van der Kolk (Topsectorsecretaris)