



<b>General information</b>	
PPP number	<b>TKI-AF-15233</b>
Title	<b>PEFPACK - Duurzame verpakkingsmaterialen gebaseerd op agrozijstroom</b> ( <i>Sustainable packaging materials based on agricultural side streams</i> )
Roadmap/Umbrella	<b>Biobased Economy (nu Circulair)</b>
Executive knowledge institution(s)	<b>Wageningen Food &amp; Biobased Research</b>
Research project leader (name + e-mail address)	<b>Maarten van der Zee (maarten.vanderzee@wur.nl)</b>
Main applicant (on behalf of private parties)	<b>Andrea Arias (andrea.arias@corbion.com)</b> <b>Stephan Roest (stephan.roest@corbion.com)</b>
Government contact person	<b>Jan van Esch (j.w.j.vanesch@minez.nl)</b>
Start date	<b>01-04-2016</b>
End date	<b>30-05-2019</b>

<b>Approval main applicant/consortium</b>	
The main applicant 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:	

<b>Short content description/aim PPS</b>	
<p>In the PEFPACK project, Corbion, Refresco, Plastipak and WFBR work together across the packaging value chain in the research and development of PEF, a polymer based on furan dicarboxylic acid (FDCA). Elements of the project include the production routes of FDCA-based polymers (with Corbion and WFBR), and its subsequent conversion in to packaging films (WFBR) and beverage bottles (WFBR, Plastipak and Refresco).</p> <p>Unique aspects of the project include the investigation of the addition of co-monomers to improve the properties of PEF (WFBR), as well as exploring the recyclability of the material (Plastipak, Refresco and WFBR).</p>	

<b>Planning and progress</b>	
Is the PPP going according to plan? <sup>1</sup>	Yes. Although according to the updated Workplan 2017 version 2 (dd 20-01-2017) the project will end in May 2019, all project partners indicated to aim for finalizing the project on 31-12-2018.
Have there been changes in the consortium/project partners?	Yes: With effect from 1 October 2017, Plastipak has joined the consortium. Plastipak's in kind contribution will have an average value of around € 50,000 per year, for 2017 and 2018 and will consist of research on application of the developed FDCA-based materials as packaging material for beverages, including the production of preforms and blown bottles of developed materials and relevant application tests. Herewith

<sup>1</sup> If applicable, use the explanation from the financial project report

	an intended producer of the products developed has joined the consortium, which will increase the possibilities of utilisation/valorisation of the knowledge developed.
Is there a delay and/or deferred delivery date?	No: Project is on schedule according to the updated Workplan 2017 version 2 (dd 20-01-2017).
Are there any substantive bottlenecks? Provide a brief description	Currently no bottlenecks foreseen
Are there any deviations from the projected budget?	No: Budget is on schedule according to the updated Workplan 2017 version 2 (dd 20-01-2017).
Do you expect a patent application to arise from this PPP?	Possibly

<p>Current summary of the project for the website Kennisonline</p> <p><b>PEFPACK – Developing new food and beverage packaging based on PEF</b></p> <p>Leading plastic packaging designer and manufacturer Plastipak has joined the PEFPACK project which seeks to develop new food and beverage packaging based on PEF and PEF co-polymers. The move reflects the core sustainability values at the heart of Plastipak and also the increasing demand in the industry for PEF, the bio-based equivalent of PET.</p> <p>Plastipak joins Corbion, Refresco and Wageningen Food &amp; Biobased Research (WFBR) who are already partners in the project.</p> <p><b>Project scope</b></p> <p>The PEFPACK project is committed to the research and development of PEF, a polymer based on FDCA (furan dicarboxylic acid) across the packaging value chain. Elements of the project include the production routes of FDCA-based polymers (with Corbion and WFBR), and its subsequent conversion in to packaging films (WFBR) and bottles (WFBR, Plastipak and Refresco).</p> <p>Unique aspects of the project include the investigation of the addition of co-monomers to improve the properties of PEF, as well as exploring the recyclability of the material (with Plastipak, Refresco and WFBR).</p> <p><b>Benefits of PEF</b></p> <p>PEF is a bio-based alternative polymer to PET which is commonly used in packaging applications. PEF can be made from the byproducts of agricultural streams and therefore contributes to the efficient use of renewable resources. As it is a bio-based material, PEF leads to a reduction in CO<sub>2</sub> emissions when replacing PET (which is based on fossil-based TPA (terephthalic acid)).</p> <p>Additionally, PEF potentially may have properties that will lead to better packaging functionality in terms of both manufacture and performance. Benefits may include lower energy consumption in production, improved barrier properties for increased shelf-life of packaged food, as well as lighter-weight packaging needed to deliver equivalent performance. As a direct replacement for PET, there would be no impact on conversion and logistical chains.</p> <p>Miguel Vieira, Director International Packaging Development of Plastipak said “We are extremely pleased to join this exciting, forward-looking project. As Europe’s leading producer and recycler of rigid plastic packaging for food and beverage markets, Plastipak has much to contribute both in the research and industrialisation phases. Sustainability is a core pillar of our company values, and this initiative is a clear demonstration of our continued commitment to the minimising the impact we have on the environment”.</p>
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<p><b>Highlights:</b></p> <p>The following results have been achieved so far:</p> <ul style="list-style-type: none"> <li>• Approx. 50 kg of purified, polymer grade FDCA was produced for the project through microbial oxidation of HMF.</li> </ul>
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- Part of this FDCA was used to produce various R&D-, reactor-, and SSPC-grades of PEF which were subsequently characterized with regard to molar mass, intrinsic viscosity, DEG contents, thermal properties, rheological properties, crystallisation behaviour, etc.
- Several sheet-extrusion trials with SSPC grade PEF have been performed resulting in a substantial number of PEF film samples, suitable for 2D biaxial stretching trials to modify the mechanical and barrier properties of the material.
- A series of 2D biaxial stretching trials have been performed on PEF film samples providing essential information on stretching behaviour required for optimization processing conditions for packaging film production and bottle blowing.
- A range of reactive extrusion trials (ranging from 20 gram-scale to several kilogram-scale) have been performed to modify the FDCA-based polymer
- Several PEF polymerization trials have been performed on 30 gram-scale introducing small amounts of comonomers with the aim of altering/improving the material properties. Several materials have been synthesized and characterized with regard to incorporation ratio, molar mass, DEG content and thermal properties. A selection of most promising polymerizations is being scaled up to the kilogram level.

<b>Number of delivered products in 2016</b>			
Academic articles	Reports	Articles in journals	Introductions/workshops
0	0	0	0

#### **Appendix: Names of the products or a link to the products on a public website**

No public reports published so far.

#### **Link naar Kennisonline/TKI AF:**

<https://www.wur.nl/nl/Onderzoek-Resultaten/Onderzoeksprojecten-LNV/Expertisegebieden/kennisonline/Duurzame-verpakkingsmaterialen.htm>

<http://topsectoragrifood.nl/project/duurzame-verpakkingsmaterialen-gebaseerd-op-agrozijstroom/>

Akkoord: Hans van der Kolk (Topsectorsecretaris)